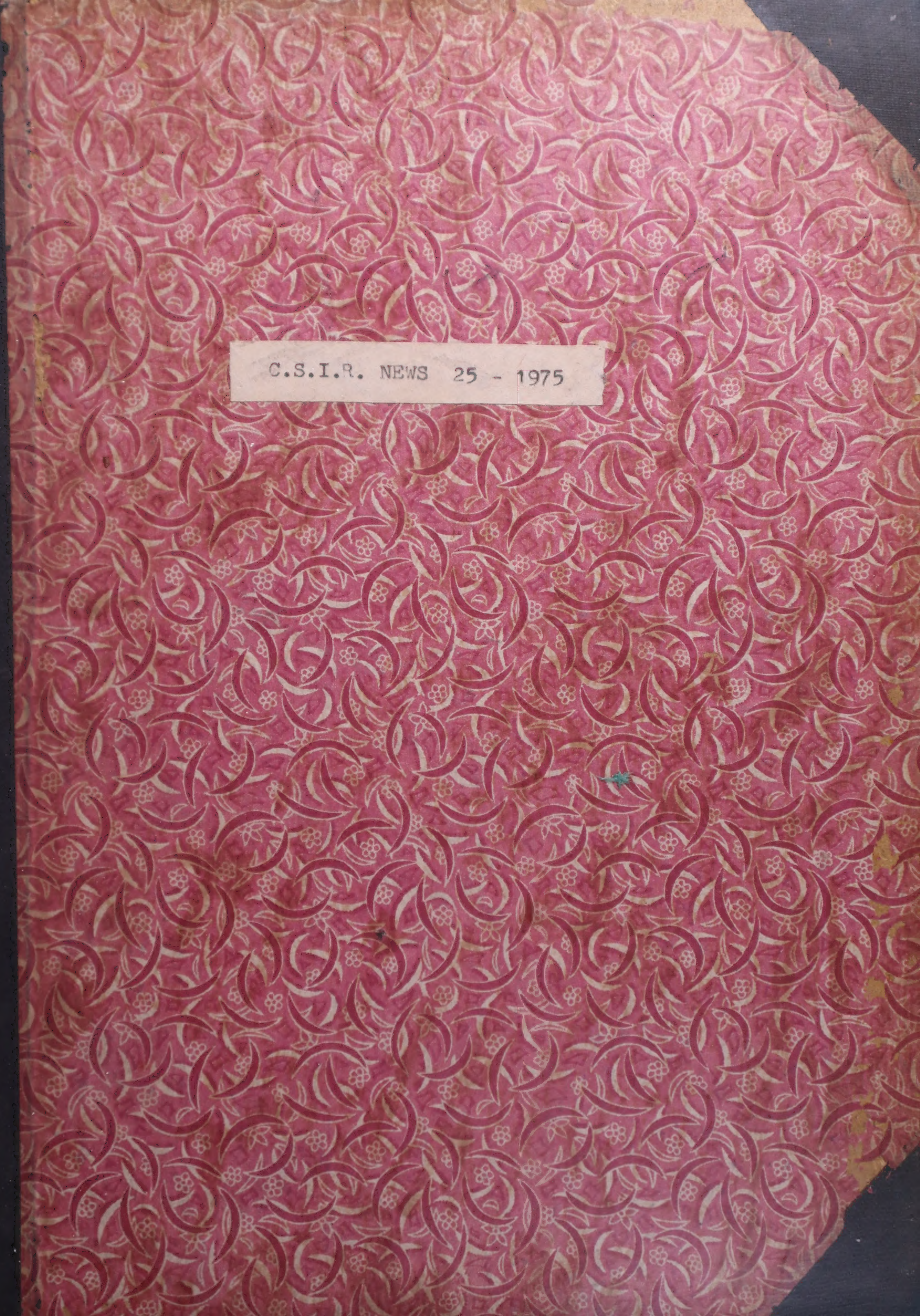

C.S.I.R. NEWS 25 - 1975

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CSIR NEWS
A FORTNIGHTLY HOUSE BULLETIN OF CSIR
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Two CSIR Scientists Win National Metallurgists Day Awards 1974

Dr V. S. Arunachalam of the National Aeronautical Laboratory (NAL), Bangalore, and Shri K. N. Gupta of the National Metallurgical Laboratory (NML), Jamshedpur, are among the four metallurgists of the year (1974). Each of the awardees received a cash prize of Rs 3000 and a scroll of honour. The awards were presented to the recipients by Shri Wadud Khan, Secretary to the Government of India and Chairman, Steel Authority of India Ltd, at a function held in Bombay on 14 November 1974. These awards are given every year by the Ministry of Steel and Mines for outstanding contributions in metallurgy.

Dr V. S. Arunachalam

Dr Arunachalam has made outstanding contributions in the fields of physical, mechanical and powder metallurgy. Dr Arunachalam, a research metallurgist working in the Materials Science Division of the National Aeronautical Laboratory for the past five years, was educated at the universities of Mysore, Saugor and Wales. Prior to joining NAL, Dr Arunachalam worked for about 10 years with the Bhabha Atomic Research Centre. He is now engaged in a project aimed at the production of titanium alloys starting from powder. This development now under way at NAL envisages the production of titanium particulates using the novel electron beam set-up and later consolidating them to required shapes and sizes. The method is expected to cut the high cost of production of titanium, making it attractive for increased applications in the national economy.

Dr Arunachalam's field of studies at NAL includes structure and properties of ordered alloys and role of second phase particles in developing creep strength. Dr Arunachalam is widely travelled and has worked in a number of laboratories in UK, USA and Sweden. During 1970-71, he was a Visiting Research Scientist at the Aerospace Research Laboratory, USA. He visited USSR last year at the invitation of the USSR Academy of Sciences and delivered seminar lectures at various metallurgical institutions in Soviet Union. He is a joint editor of the *Transactions of the Indian Institute of Metals*.

Shri K. N. Gupta

Shri Gupta has made outstanding contributions to iron and steel research and technology, particularly in the field of direct reduction of iron ores to produce sponge iron. He has developed a process for sponge iron production by directly reducing iron ores with hydrocarbons, particularly naphtha. Based on the success of this process, a 8-10 tonne per day capacity sponge iron plant is being installed at NML.

Shri Gupta has developed several tests for determining the suitability of iron ores and coal, including the newly developed iron ore deposits, for blast furnaces or sponge iron furnaces. He has completed about 30 sponsored investigations for various steel plants, state and public sector undertakings and other organizations. These include a UNIDO project investigated by NML on the production of pig iron from low-grade iron from Asswan (Arab Republic of Egypt).

Some of his current assignments relate to the development of rotary reduction test apparatus and gas and solid reductant-based vertical shaft and retort approaches for the production of sponge iron from iron ores. His work on the reduction of manganese ore for the production of high-grade manganese dioxide and electrolytic manganese is also worthy of mention.

Shri Gupta (born Dec. 1934), took his B.Sc. (Met. Engg.) and M.Sc. (Met. Engg.) degrees from the Banaras Hindu University and joined the College of Mining & Metallurgy (B.H.U.) in 1959. Here he was responsible for designing, installing and operating several small-scale pilot plants in the field of iron and steel technology. He joined NML in 1962 and was appointed Assistant Director in July 1972. He has to his credit a large number of technical papers and investigation reports.

MERADO Develops Automatic Bottle Washing Machine

The Mechanical Engineering Research & Development Organization (MERADO), Madras, has designed and developed, in collaboration with Rita Agencies, Madras, a fully automatic bottle washing machine. MERADO supplied the complete design drawings, and collaborated in the fabrication and assembly of the prototype, and also in conducting extensive trials. This is the first time in India that a machine of this type is being marketed with 100% indigenous technology and components.

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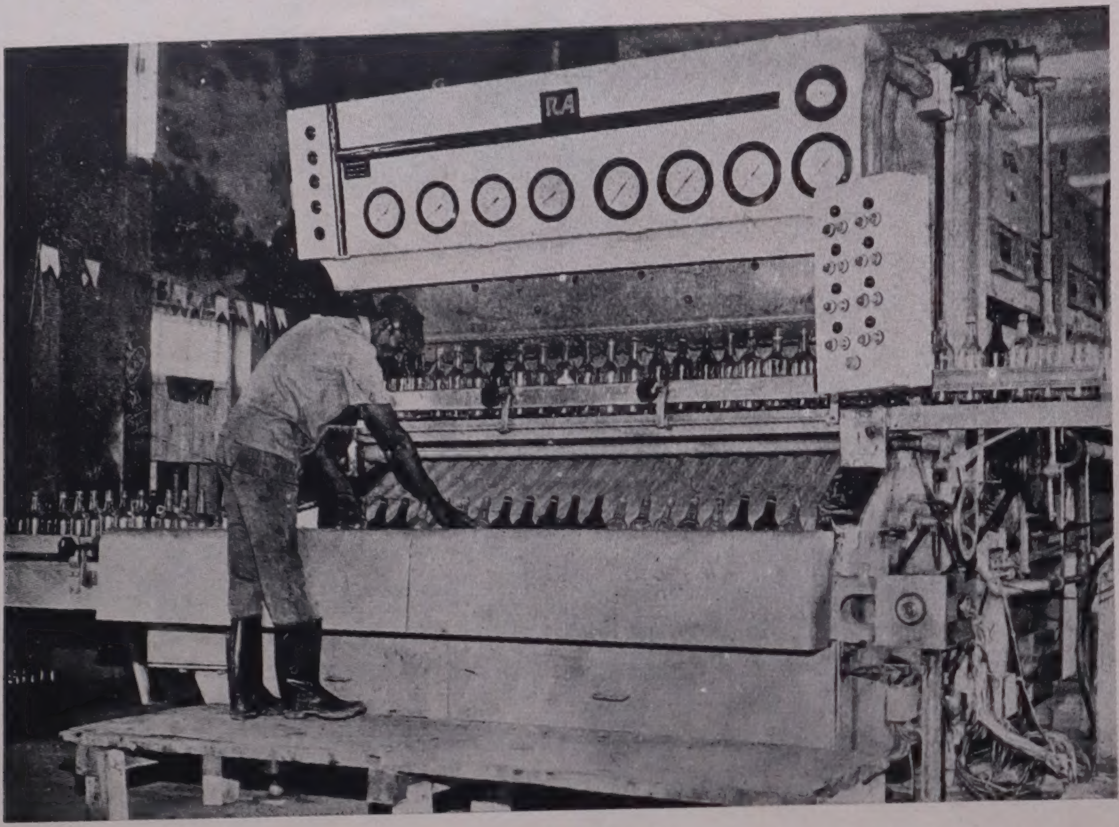

Automatic bottle washing machine

The operation of the machine was demonstrated at the factory premises of the firm on 29 November 1974.

Sophisticated and high output machineries used in bottling plants to cater to the needs of breweries, distilleries, aerated water plants, etc. have been hitherto imported. This project undertaken by MERADO (Madras) will, therefore, help meet the country's demand to a considerable extent and is a major step towards import substitution.

The machine has been designed to handle bottles of all ranges between 350 ml and 750 ml capacity. It has a rated capacity of cleaning about 6000 bottles (650 ml capacity) per hour. The overall dimensions of the machine are approximately 7 m (length) × 2·5 m (width) × 2·5 m (height), and the machine weighs over 12 tonnes. The current selling price of the machine would be about Rs 4 lakh.

The automatic bottle washing machine essentially consists of an endless link conveyor carrying 'baskets' in which bottles to be washed are carried. During their passage inside the washing machine, the bottles are subjected to both spraying and soaking at different points. After a preliminary spray, the bottles are dipped in a soaking bath of lye solution, and subsequently in different spraying zones, they are subjected to successive interior and exterior spraying of lye solution and water at different temperatures. The two operations of feeding-in of dirty bottles and discharge of the clean bottles are both performed through the same end of the washing machine.

MERADO (Madras) is also collaborating with the same firm for the development and manufacture of (i) filling and crown corking machine; (ii) allround spraying machine; and (iii) premixer for soft drinks.

VITM Exports Dioramas to Sweden

The Visvesvaraya Industrial & Technological Museum (VITM), Bangalore, has designed and fabricated two dioramas on 'history of communication' for the Techniska Museet (National Museum of Science and Technology), Stockholm. The two dioramas are Beacon Fire and Semaphore Tower, each of dimensions 1505 × 1320 × 745 mm, and were fabricated using fibreglass in order to reduce the weight and eliminate chances of breakage. The two units were exported to Sweden.

Conference Briefs

Dr H. S. R. Desikachar of the Central Food Technological Research Institute (CFTRI), Mysore, participated in the international conference on Rice Byproducts Utilization held in Valencia (Spain) from 30 September to 2 October 1974. Organized under the auspices of the Fourth International Congress of Food Science and Technology, the conference was attended by about 50 specialists comprising scientists, rice millers and policy-makers from various countries. The conference was held in four sessions devoted to : (i) Utilization of husk, (ii) Preservation of byproducts, (iii) Production and utilization of rice bran oil, and (iv) Nutritive value and utilization of rice bran. A brief account of each of the sessions and the general recommendations of the conference follows.

Utilization of husk : It was suggested that the husk should be burnt under specific conditions for deriving maximum calories and the heat thus produced could be used for running boilers, heating air for mechanical driers which could be used for the dehydration of paddy, and production of electrical power with suitable generators. The husk ash can be used for the production of cement and light-weight fire bricks. However, economics of such an approach will have to be assessed by the country concerned. Husk ash could also be used for producing high-grade sodium silicate, furfural, hardboards, activated carbon, diluent in animal feed concentrates, briquettes for fuel, etc. The economics of manufacturing these products have to be established keeping in view the conditions prevailing in the country.

Preservation of byproducts : Byproducts of rice milling such as bran and germs could be used for the extraction of oil. Rice bran could be stabilized by inactivation of enzyme lipase and lipoxidase responsible for rancidity development by applying adequate heat (Wet heat treatment followed by drying has given the most desirable result).

Production and utilization of rice bran oil : By proper de-waxing, bleaching and subsequent refining rice bran oil can be made useful for human consumption.

Nutritive value and utilization of rice bran : After it has been stabilized, rice bran can be used in the manufacture of animal feed or even for human consumption if properly fractionated to obtain protein-rich edible grade rice bran with low fibre content.

After the conclusion of the main conference, there was a meeting of IUFoST Working Party on the utilization of rice which discussed many issues relating to the collection and dissemination of progress reports relating to rice research. It was agreed that the annual reports of work relating to the post-harvest technology of rice should be collected by one centre in each country and that this information be passed on to Dr Barber (Spain). His institute would print these reports and distribute them to all participating research centres. As far as India was concerned the Central Food Technological Research Institute, Mysore, would be the centre for collecting such information from different rice research institutions in India.

Deputation Briefs

Dr Asghar Husain of the Regional Research Laboratory (RRL), Hyderabad, was deputed to USA under the Scientists' Exchange Programme between CSIR and the National Science Foundation, Washington, from 2 May to 13 August 1974. The purpose of his study tour in USA was to gain an overall perspective of the fast-growing field of computer-aided process synthesis and analysis.

Dr Asghar Husain visited five leading universities engaged in the above field, and spent most of his deputation period at the University of Houston, Houston-Texas. During these visits, he was able to meet and have discussions with several experts and collect a good deal of useful information regarding synthesis and analysis of chemical processing systems. He also delivered lectures on multistage multidimensional optimization strategies for chemical engineering problems, an area in which his group at RRL, Hyderabad, has done extensive work during the past six years. In addition, he participated in the Summer Computer Simulation Conference held at Houston during 9-11 July 1974 and visited three chemical plants in different parts of the country. On his way to USA, he visited Veb Kombinat Robotron in Dresdon (GDR), an organization which manufactures computers; he also visited their training centre in Leipzig.

During the last two decades, the computer has evolved as a powerful tool for decision-making in all areas of human activity. This in turn calls for the adoption of a system analysis approach by mathematical modelling of the assigned problems. The model is then executed on the computer repetitively in order to study the cause and effect relationship of the various decisions prior to their implementation in practice. The system analysis typically involves the calculation of outputs from a known process when input conditions are given. This can be achieved for the chemical processing systems theoretically by examining and modelling underlying physical, chemical and possibly biological phenomena occurring in the system and/or empirically by observing the responses of the system to various external stimuli. The system performance can then be optimized mathematically by employing various techniques such as dynamic programming, maximum principle, linear programming and other search techniques and/or empirically by conducting statistically designed or systematically programmed experiments.

A great deal of effort has been made during the last decade in preparing general purpose computer programme for simulating a large number of processes. A majority of them being modular in character are flexible enough to enable the user to supply any of his computational modules in simulating a particular network of process units. However, they differ from each other in features like data transfer between modules and system bases as well as the physical property packages of pure components. Almost all of them are operated in batch mode except a few which are dynamic in nature and provide the facility of a continuous dialogue between the user and the computer.

In the simulation of a large-scale integrated system such as a whole chemical plant or of an economic or managerial system, it is essential to solve large sets of linear/nonlinear simultaneous equations with recycle of information. This poses a formidable computational problem, which requires a large-scale system to be broken up into a number of irreducible subsystems in order to make the information flow unidirectional. Therefore, analysis of all the practical systems involves partitioning, disjointing and possibly tearing a few subsystems to render the calculations manageable.

In contrast to analysis, synthesis involves conceiving a process which can transform given inputs into the given outputs; therefore, characteristically it uses an inductive logic. Besides using continuous variables like analysis, which are differentiable and amenable to handling by known mathematical techniques, synthesis has also to deal with discrete variables. Hence, the capabilities of synthesizing the chemical process and other type of systems are not yet developed quantitatively to the extent that analysis has been developed. However, during the last decade, a number of important studies have been reported which are the first attempts towards placing the synthesis on a more systematic basis. These developments are of great significance, since synthe-

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sis is a keystone to all process development and design.

Tremendous amount of literature has grown on the aspects of computer usage discussed above. This puts a heavy responsibility on the scientists engaged in development and design of processes to grasp, digest, develop and utilize all that information on these modern methods in their efforts to reduce the time required for commercial exploitation of the processes. In this respect, RRL, Hyderabad is taking the initiative and putting a great deal of effort in promoting the use of modern computer-aided techniques in project work.

Wealth of India - Industrial Products : Part VIII

Part VIII of the Wealth of India – Industrial Products has been brought out by the Publications & Information Directorate, New Delhi. This 302-page encyclopaedic volume (demy 4to) deals with 26 Indian industries, covering the alphabetical sequence Si - Ti. The articles included in the volume present comprehensive accounts of the industries dealt with as regards their history, development, technology involved, raw materials required, end uses, specifications for raw materials as well as finished products, and statistical data regarding production, demand, exports, imports and prices. The articles are suitably illustrated with diagrams, charts and photographs (114 in all) and the data systematically presented in tabular form. References to the sources of literature and the organizations which have supplied information are included at appropriate places.

The industries dealt with in the volume are : Silk; Silver compounds; Slate and slate-pencils; Soaps and synthetic detergents; Sodium compounds; Sports goods; Springs; Starches and dextrins; Steel furniture; Steel structurals and fabrication; Steel tubes and pipes; Stoves; Strontium compounds; Strychnine and its compounds; Sugar; Sulphur compounds; Surgical dressings; Surgical instruments; Synthetic fibres; Tea; Television receivers; Textile auxiliaries; Tiles; Tin compounds; Tinplate; and Titanium compounds.

The publication can be had from the Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012.

Progress Reports

CECRI Annual Report : 1973

The Central Electrochemical Research Institute (CECRI), Karaikudi, has brought out its annual report for 1973, which records the R & D work done in the institute under the following disciplines : batteries; corrosion; electrometallurgy and electrothermics; electro-organic and electro-inorganic products; electroplating, electrodeposition and metal finishing; solid state electrochemistry; and instrumentation and special techniques. A number of processes were developed during the year. The pilot plants for producing electrolytic manganese dioxide (50 kg/day) from manganese chloride was operated. Manganese chloride in turn was obtained utilizing only indigenous raw materials and indigenously fabricated equipment. The product was found to be acceptable to the consumer industries and some consumers even reported superiority of this product over the product produced by the electrolysis of manganese sulphate solution.

p-Aminobenzoic acid, an intermediate in the production of benzocaine, procaine hydrochloride and folic acid, was prepared by the electrolytic reduction of *p*-nitrobenzoic acid. The process was studied in a 350 A cell (capacity, 5 kg/day) and required *p*-nitrobenzoic acid, soda ash, and sulphuric and hydrochloric acids as the main raw materials. Cost estimates for 30 tonnes per annum plant have been worked out and a detailed technical report has been prepared.

A certain amount of rejects occurs in the electroplating industry due to faulty control of operating conditions. In such cases, the defective deposit should be removed by stripping without damaging the substrate in order to get it electroplated again. The institute has developed an alkaline stripping additive mixture which removes the electrodeposits by simple immersion of the rejects. This solution is suitable for removing nickel, copper, zinc, cadmium, silver and brass electrodeposits on iron/steel. Cost estimates for producing 11·5 tonnes/annum of this stripper have been worked out. Zinc chromate primer in epoxy ester linseed solid, modified phenolic stand oil or in linseed alkyd phenolic hardener can be used on all types of steel structures as well as structures consisting of both ferrous and non-ferrous parts. Zinc chromate primer does not appear to be used in India at present for steel structures, but if introduced in the market, there is likely to be a demand for 10,000 tonnes per annum in the country. Five litres of the paint were prepared in each batch using a rotating jar mill, and 40 litres of the product were produced.

The continuous etching and forming of super pure aluminium foil, used as anodes in electrolytic capacitors, was done by a new electrolyte system. An improved etch ratio of 50 at 30V forming a weight loss of 25-30% was obtained. The electrolyte was tried for continuous etching of 2·5 cm foil.

Small nickel-cadmium cells (pocket type) were assembled using the active material composition developed at the institute earlier. The cells gave a capacity of 1·7 A-hr. The design of the AN/PRC (sintered type) battery was modified to reduce the weight. The improved version of the battery (weight, 7·5 kg) had a capacity of 8·0 A-hr.

Fundamental studies on corrosion potential and linear polarization of corroding metals showed that the linear polarization method could be used for measuring instantaneous corrosion rates. Studies were repeated for iron in hydrochloric acid.

By employing suitable fluxing agents, ilmenite (analyzing to *c.* 54% TiO_2) could be beneficiated to a product analyzing to 80% TiO_2 content in good yield. With some fluxing agents, maximum separation of pig iron was obtained, though lower yields of TiO_2 concentrates were obtained. Fused alumina analyzing to $>92\%$ Al_2O_3, $<4{\cdot}8\%$ MnO and $<2{\cdot}2\%$ silica was prepared from the waste aluminium slag in the arc furnace. Electrolytic production of perchlorates from sodium chloride was carried out using lead dioxide anodes. The amounts of potassium perchlorate and ammonium perchlorate produced were 512 kg and 103 kg respectively.

Hydrogen permeation in plated alloys, such as Sn-Ni, Sn-Cd, Sn-Zn, Sn-Pb, copper foil and copper-coated steel, was studied. Some of the plated alloys had a much lower hydrogen intake than tin alone or other plated metals. Sn-Ni had the lowest hydrogen permeation.

A number of compounds, viz. aniline, *p*-aminophenol, *d*-ribose, glyoxalic acid, *p*-toluidine, methylene blue and various piperazine derivatives were prepared by electrolytic reduction.

A scheme on corrosion studies of aluminium alloy for heat exchanger application, sponsored by a public sector undertaking, was taken up.

Commercial scale production of *p*-nitrobenzoic acid, lead acid battery and cadmium sulphide photoconductive cell was started during the year. Six new processes, viz. electrochemical marking of metals, acid inhibitor for pickling, lead dioxide anodes and perchlorates, calcium tungstate blue phosphor, paint-removing jelly, and electrolytic manganese dioxide, were released to entrepreneurs.

The institute rendered consultancy services to 15 firms. The expertise offered was in the problem areas of materials protection, batteries, metal finishing, industrial electrolytics, photocells and waste utilization.

Twenty-eight patents were filed, and 20 research and 20 review papers were published during the year.

CSIR Support To Research

New Schemes

Diosgenin Production from Plant Tissue Cultures *in Vitro*

Diosgenin, a steroidal saponin, has been studied *in vitro* tissue cultures using various techniques, such as thin layer chromatography, melting point, infrared spectroscopy and gas-liquid chromatography. A technique of feeding cholesterol as well as various growth regulators to the growing tissue and increasing the diosgenin content has been developed.

Under a new CSIR scheme granted to Dr (Miss) Pushpa Khanna of the Department of Botany, Rajasthan University, Jaipur, some plants containing diosgenin will be grown *in vitro* as static and suspension cultures. These tissues will be harvested at different time intervals and then analyzed for diosgenin content using the techniques mentioned above. Higher yielding plant cultures will be fed cholesterol and the increase in their diosgenin content will be determined. Efforts will be made towards large-scale production of diosgenin using fermentors for growing suspension cultures.

Study of Structure of Glasses Using Warren-Mozzi Technique

Glasses are assuming increased scientific and technological importance in many fields. At present, device requirements are playing an important role in stimulating research on glass ceramics, semiconducting glasses, laser glasses, etc. Structural considerations play an important part in the formation of glasses, whether they are oxide, chalcogenide or metallic. It is important to study carefully the structure of glasses in order to develop new glass compositions to suit specific purposes. In a new CSIR scheme granted jointly to Dr R. Vasudevan (principal investigator) and Dr C. V. Gokularathnam (co-investigator) of the Department of Metallurgy, Indian Institute of Technology, Madras, it is proposed to apply the recently developed Warren-Mozzi technique to the X-ray diffraction study of the structure of a few oxides, metallic and chalcogenide glasses produced by both conventional and unconventional methods, such as vaposol or liquisol quenching.

Synthesis of Substituted Chromones as Potential CNS Agents

A new research scheme sponsored by CSIR has been granted jointly to Dr C. P. Garg and Dr R. P. Kapoor of the Chemistry Department, Kurukshetra University, Kurukshetra. It has been shown that compounds containing the chromone nucleus possess marked stimulating effects on the Central Nervous System (CNS). It is proposed to synthesize a large variety of 2- and 3-N-substituted aminochromones and evaluate in detail their pharmacological activities as CNS agents.

Ribosomes and Ribonucleases

Ribosomes are perhaps the most complicated organelles of the cell in terms of both structure and function. Considerable amount of work in this area has been done and is still being carried out in different laboratories of the world. On the basis of the work carried out earlier at the Department of Biochemistry, Institute of Medical Sciences, Banaras Hindu University, Varanasi, attempts will be made to use Ribonuclease I of *Salmonella typhimurium* in probing the structure of the ribosomes and their subunits. The mechanism of specific association of RNase I with the smaller subunits of the ribosomes (of the enteric bacteria only) will be explored. This investigation with Prof. D. P. Burma of the Department as the principal investigator is expected to yield information about the overall differences in the structural organization between the two subunits. Further, the study of the susceptibility of the ribosomal subunits to various ribonucleases at the various steps of protein synthesis will be investigated. Special emphasis will be laid on the alteration of conformation of the smaller subunits by the initiation factors. The proposed work is expected to lead to information which may be useful for researchers interested in increasing the protein content of foods.

Development of Solar Air Conditioner and Solar Ice-making Machine

In view of the prevailing acute shortage of the conventional sources of energy, it is of vital importance that solar energy, which is available in plenty in all parts of our country, is utilized to the maximum possible extent. The above research scheme granted jointly to Dr S. Lal (principal investigator) and Dr C. P. Gupta (co-investigator) of the Mechanical and Industrial Engineering Department, University of Roorkee, Roorkee, pertains to research and development work concerned with the utilization of solar energy in the field of refrigeration and airconditioning with the following objectives : (1) Development of a 1·5 tonne airconditioner using solar energy; both ammonia-water and ammonia-sodium thiocyanate systems will be investigated; and (2) development of an ice-making machine using solar energy (unit capacity, about 100 kg ice per day); only ammonia-sodium thiocyanate system will be used, but both intermittent and continuous cycles will be investigated.

On the basis of the available data on the theoretical and experimental performance of absorption refrigeration systems using solar energy, detailed designs of the components of the 1·5 tonne solar airconditioner and the 100 kg per day ice-making machine will be made. This would essentially involve the design of collectors, generator, energy storage tank (for use during sun-off hours), condenser, evaporator, absorber, heat exchanger and piping. It is proposed to use flat plate collectors. The feasibility of combining the collectors and generators into a single unit will also be investigated. Prototypes of the systems designed will be fabricated locally and installed. Detailed experimental investigation will be carried out on the performance of the systems. This would involve measurement of solar insolation, collector efficiency, variation of generator and absorber temperatures with ambient temperature and with time of the day, coefficient of performance, conditions maintained inside cooled space and the rate of production of ice (for the ice machine). The effects of varying solution concentration and generator and absorber temperatures on system performance will be studied.

Post-infectional Production of Fungitoxic Substance in Rice Plants

Phytoalexins are fungitoxic chemicals produced in plants in response to infection with various fungi and are believed to play an important role in the natural defence of plants against potential pathogens. There is well documented evidence that a fungitoxic substance of phytoalexin type is produced in rice plants in response to interaction with the brown spot pathogen, *Helminthosporium oryzae*. Three cardinal points clearly established in this connection are : (i) the mildly virulent race of *H. oryzae* induces greater production of the fungitoxic substance in rice tissue than the virulent race; (ii) the resistant varieties produce more of this substance on inoculation than the susceptible varieties; and (iii) the mild race of *H. oryzae* and non-pathogens of rice are more sensitive to this substance than the virulent race. It has been further shown that inoculation of susceptible rice varieties with the mild race makes them fairly resistant to a subsequent challenge inoculation with the virulent race of *H. oryzae*, the degree of induced resistance varying with the concentration of mild race inoculum, age of the plant, and the gap in time between two inoculations. Under optimum conditions, a high degree of protection can be given to rice plants by a previous inoculation with the mild race. Such protection appears to be linked with the high level production of fungitoxic substance induced in rice plants by the mild race.

Under a new CSIR scheme sanctioned to him, Dr A. K. Sinha of the Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Kalyani (West Bengal), proposes to extend these studies. The main objectives of this scheme are : (i) to study certain aspects of the post-infectional production of the fungitoxic substance in question, such as the influence of light and temperature conditions and relation with infection induced changes in rice tissue respiration, (ii) to get some idea of its chemical nature, (iii) to determine its antimicrobial spectrum, and (iv) to induce its production in rice tissue by treatment with various chemicals known to induce phytoalexin synthesis in other plants.

Information gathered from this investigation may clarify the nature of the phytoalexin involved and enable identification of the conditions favouring its production in the host tissue, thus giving a physiological basis to the defence mechanism in rice plants to *H. oryzae*, and perhaps to some other pathogens. It may also become possible, on the basis of these studies, to formulate control measures against the brown spot pathogen involving the use of certain chemicals that will develop an internal resistance in rice plants through the induced production of phytoalexin concerned.

PATENTS ACCEPTED

Indian Pat. 396/72

A stove suited for domestic use

S. K. Khanna & A. K. Shaha
Indian Institute of Petroleum, Dehra Dun

A salient feature of this domestic stove is that it effects 50% savings in fuel consumption. The stove has been specially designed to prevent heat losses by radiation and convection and also utilize this heat for preheating the air needed for combustion. Other features are : (i) quick, automatic and strong heating without the need for fanning; (ii) emission of less smoke with the heat spreading out and cooking being done quickly; and (iii) durability and portability.

The smoke-removing device consists of a short pipe, fixed on a disc, called starter, and an open hollow cylinder, meant to surround any cooking vessel placed on the oven so that the heat available for cooking would not be diverted or influenced by outside air. The heat-conserving ring is used before as well as after the fuel bed has been lighted up. It prevents the heat loss by radiation and convection; it also prevents the heat from spreading over the atmosphere of the kitchen.

The stove consists of two concentric cylinders built one within the other on a metal base, the inner one made of refractory material and outer one of metal sheet with an insulated air space between the two cylinders. Two air inlets are provided on the body of outer cylinder; the first one fitted with shutting door faces the single intake opening provided on the body of the inner cylinder, and the second one is an open air intake aperture made on the opposite side on the outer cylinder. The air automatically circulates within the insulating air space in semicircles over the right left passages, washing the walls of the inner cylinder and getting thereby preheated before entering the combustion chamber. The first intake is shut up when the stove has been lighted so that air for combustion can enter via the second intake only.

The stove is provided with a turnable and removable grating. After cooking is finished the grating is turned over by means of a poker, and the unburnt fuel drops down and can be removed, quenched and reused. Such a treatment provides an additional fuel economy of 30-40%.

The total thermal economy effected by the newly designed stove is 65, 48 and 36% in the case of soft coke, lignite and charcoal respectively. The effect of recuperation is 24, 16 and 15% in the case of soft coke, lignite and charcoal respectively.

The effect of recuperation would increase with the duration for which the stove is used. If the ring is made of an insulating material, such as fire clay or mud, the efficiency will be greater.

Indian Pat. 133309

Device for feeding a gas detector tube with gas

K. K. Acharyya
Central Mining Research Station, Dhanbad

In estimating the concentration of a gas or a vapour using detector tubes a device is required to feed the detector tubes with a measured volume of gas. The process of feeding each time using the present-day device entails two operations, viz. (i) to connect the device to the gas reservoir for sampling a measured quantity of the gas and then after disconnection, (ii) to connect it again to the detector tube to pass the gas through it. Thus the process is tedious and time-consuming, and gives rise to sources of error and often requires the assistance of another.

The device, covered by the patent under reference, overcomes the above drawbacks. The experimenter is required to connect the device with, disconnect it from, the detector tube only once during the entire work, whatever the volume of the gas required to be handled. The device is cheap, entirely indigenous and compact. The materials required for making its components are also easily available. Since the device works in conjunction with a syringe the measurement of the volume of the gas either sucked into or expelled from is precise even to the small fraction of a cubic centimetre. When the pressure of the gas reservoir is above or below the atmospheric pressure, the volume of the gas drawn inside the syringe can be easily taken back to the atmospheric pressure by manipulation of the syringe-piston and thus renders volume correction unnecessary. The internal volume of the device has been kept to the minimum and hence it requires only a small volume of gas for flushing. Moreover, with a little adjustment of the suction tube, the device can work with the aspirator-bulb also.

Indian Pat. 135030

Improvements in or relating to prevention of tarnishing of copper and copper base alloys

A. N. Mukherje, S. R. Addanki & A.K. Lahiri
National Metallurgical Laboratory, Jamshedpur

The invention covered by the patent relates to an improved process for preventing or improving the tarnish resistance of copper and copper base alloys, particularly during storage and transit.

Copper wires, strips and similar small articles generally develop black stains or some sort of discoloration when they are exposed to atmospheres, particularly those contaminated with traces of industrial gases such as hydrogen sulphide and sulphur dioxide. Such black stains reduce consumer attractiveness and raise doubts about the quality of the products.

The coating process involves preliminary cleaning of the articles and then dipping in a solution of specified composition containing chromate salts. The coating thus obtained is transparent, and considerably improves the tarnish resistance of the articles. All the chemicals and equipment required in this process are indigenously available.

The coating process is expected to cost about 5-8 paise per square metre of surface area to be coated. Lacquering costs about 10 times more, and treatment with imported organic chemicals, viz. benzotrizole, 60 to 80 times more.

The process is suitable for preventing tarnishing of copper wires, strips and articles made of brass, bronze, etc., particularly during storage and transit.

PATENTS FILED

1330/Cal/74 : A process for manufacture of silver graphite compositions, D. Sen—NPL, New Delhi.

1334/Cal/74 : Vacuum safety valve (float type), B. Dev & S. K. Behal—CSIO, Chandigarh.

1335/Cal/74 : A process for the recovery of vanadium from bauxite residue (red mud), R. S. Thakur, J. Muralidhar & B. R. Sant—RRL, Bhubaneswar.

1457/Cal/74 : A method for the preparation of iron oxide-chromium oxide catalyst by precipitation from homogeneous solution, J.R. Rao & B.R. Sant—RRL, Bhubaneswar.

1532/Cal/74 : Improvements in or relating to inhibition of corrosion of steel in cooling water systems without chromate, N. Subramanyan, K. Balakrishnan, B. Satrianandham & M. Krishnan—CECRI, Karaikudi.

1569/Cal/74 : Improved etchants for fabrication of capacitor array by selectively etching aluminium, silicon monoxide and aluminium layers, deposited on glass substrates, A. Singh & Y. K. Jain—CEERI, Pilani.

1570/Cal/74 : A technique of baking and cooling operation for semiconductor devices utilizing a novel all-glass apparatus, W.S. Khokle & A.K. Ray—CEERI, Pilani.

1629/Cal/74 : Improvements in or relating to the manufacture of paraffin wax from slack wax, R. K. Majumdar, S. A. Athar Rizvi, S. R. Dutta Chaudhury & V. S. Bhaskar Rao—RRL, Jorhat.

1631/Cal/74 : A new process for the production of metol (N-methyl *p*-aminophenol sulphate), a photographic developer from *p*-aminophenol, R. C. Rastogi, D.N. Sharma & J.N. Baruah—RRL, Jorhat.

1763/Cal/74 : Chemical modification of hides, skins and leathers by graft polymerization with vinyl monomers, K. P. Rao, K. T. Joseph, D. H. Kamat, Y. Nayudamma & K. T. Sarkar—CLRI, Madras.

1769/Cal/74 : Improvements in or relating to an evaporation source for evaporating silicon monoxide, Y. K. Jain & B. R. Marathe—CEERI, Pilani.

1803/Cal/74 : A process for the preparation of trypsin from buffalo and goat pancreas, V. C. Pandey, L. M. Tripathi & V. K. Mohan Rao—CDRI, Lucknow.

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Production of Salt and Marine Chemicals in Orissa Region

Seminar at RRL, Bhubaneswar

The Regional Research Laboratory (RRL), Bhubaneswar, organized a seminar on Production of Salt and Marine Chemicals in Orissa Region on 7 December 1974. The seminar was inaugurated by Shri K. C. Lenka, Minister of State for Industries, Government of Orissa. Prof. P. K. Jena, Director, RRL, Bhubaneswar, in his welcome address said that the state of Orissa did not produce enough salt and marine chemicals to meet its requirements though it had a long coastline and therefore it was the purpose of the seminar to draw the attention of all scientists, technologists and industrialists engaged in salt manufacture towards the utilization of the vast marine wealth so that the vital sector of industry was not neglected. Prof. Jena suggested that a working group consisting of scientists of RRL, Bhubaneswar, the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, State Government officials and leading salt manufacturers both from public and private sectors should be constituted to discuss the line of action to be taken and give their recommendation for follow-up action.

Inaugurating the seminar, Shri K.C. Lenka said that the average production of salt per acre in the state was estimated at 10·2 tonnes as against the Indian average of 35 metric tonnes. Shri Lenka stated that serious thought should be given to this aspect and a concrete plan for the development of salt and marine chemical industries in the state should be made. The Minister stressed the need for joint efforts by RRL, Bhubaneswar and CSMCRI, Bhavnagar, to find solution to technical problems facing the salt and marine chemical industries in the region. Further, he said that quality control in salt manufacture should be exercised and enforced. He called upon salt manufacturers and entrepreneurs in the field to take full advantage of the scientific and technological assistance which was being offered by these two national laboratories. He welcomed the suggestion of Prof. Jena to set up a commercial-cum-demonstration salt manufacture unit in a suitable area in Orissa so that R & D work could be carried out under varied conditions to optimize the production and thereby benefit the salt manufacturers of the state.

Shri B. Venkataraman, Commissioner-cum-Secretary, Industries Department, Government of Orissa, requested the Director and scientists of the laboratory to chalk out, in collaboration with the Chairman, Industrial Promotion and Investment Corporation of Orissa Limited and other state government officials, a concrete plan for the production of salt and marine chemicals in the state of Orissa keeping in view the extensive coastal area.

A group discussion, held under the chairmanship of Shri B. Venkataraman, was attended by the representatives of the Industrial Promotion and Investment Corporation of Orissa Ltd, Industrial Development Corporation of Orissa Ltd, Jayshree Chemicals, and salt manufacturers of Ganjam, Cuttack and Balasore District.

In the working group session, presided over by Dr B. R. Sant, Scientist, RRL, Bhubaneswar, discussions were held on the possibility of optimizing production using the available technology, field survey for future salt works and organization of a salt demonstration farm as a cooperative venture for R & D work in the development of salt and marine chemicals.

UNDP/FRG Aid to SASMIRA Pilot Plant for Synthetic Fibres

In the wake of the Silver Jubilee Year of the Silk & Art Silk Mills' Research Association (SASMIRA), Bombay, a synthetic fibre pilot plant will be set up at SASMIRA with the assistance of the Federal Republic of Germany, the United Nations Development Programme and the United Nations Industrial Development Organization.

Two German experts are expected to visit SASMIRA in February 1975 at the instance of UNIDO with a view to defining the assistance required from FRG and UNDP/UNIDO respectively to establish the synthetic fibre plant. Inputs required from the Governments of FRG and India and the UNDP are expected to be determined. These inputs include the costs of imported expertise and equipment as well as fellowships for training abroad. To this end, the UNDP has agreed in principle to provide $ 735,000 with a possibility of expanding this allocation to $ 845,250 if necessary. This provision has been made for experts, equipment and fellowships. West Germany has agreed to provide the balance of the funds required for establishing the pilot plant for the manufacture of synthetic fibres, namely polyamide and polyester.

According to UNDP, the plant to be provided at SASMIRA will be used for the development and production of

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nylon and polyester fibres and the fibres produced will be used for end product development. This will provide facilities for experimental work in fibre to yarn processes for synthetic fibres and for the development and application of process and product technology in this field. It is intended to provide facilities for training and upgrading the skills of personnel in synthetic fibre technology, collect technical information, act as a non-partisan consultant and provide an impartial communication system between fibre producers, textile mills and consumers. This will help in establishing technical and advisory service in synthetic fibres to the textile industry.

Statistics : Man-made Textiles

This is a compact volume on statistics pertaining to man-made textiles. Published by the Silk & Art Silk Mills' Research Association (SASMIRA), Bombay, this will prove very useful as a reference book to all those associated with the man-made textile industry in general.

The book gives at a glance the progress and development of the man-made textile industry all over the world in terms of fibre development, fibre production, fabric production, export and import potentials. It also contains statistical record of the potential capacity of production denier-wise, country-wise and plant-wise.

The book is divided into two sections, the world and India. Under the 'world' section a statistical analysis is presented on a comparative basis regarding the production of natural and man-made fibres during 1940-72. This section also contains per capita consumption of man-made fibres and the capacity of production of different types of fibres in all the countries of the world.

The section dealing with India gives the production of both natural and man-made fibres during the years 1957-73. It also gives the production of blended fabrics, the consumption of natural and man-made fibres, per capita availability, consumption, imports and exports of man-made textiles.

A special feature of this section is the statistical information on the unit-wise production capacity of man-made fibres, state-wise distribution of powerlooms and warp knitting machines and the list of texturizing units in the country. The details furnished regarding the production of raw materials for man-made fibres and potential capacities of future production of the same are most valuable.

The handbook (66 pages, price Rs 10) is a ready statistical reference in man-made textiles.

CFTRI Training Course in Industrial Entrepreneurs

A short-term training course (20 days) in industrial entrepreneurship for youth leaders in agro-based food and allied industries was conducted by the Central Food Technological Research Institute (CFTRI), Mysore, from 16 December 1974. Dr B. L. Amla, Director, CFTRI, said in his inaugural address that the institute had attached much importance to providing technical know-how and consultancy services to entrepreneurs in launching new ventures. The CFTRI could offer a wide range of technical services such as supply of model schemes, project reports, plant layout, advice on selection of machinery and specifications, and assistance in planning and execution of projects.

This is the first in the series of short courses sponsored by the Union Ministry of Education and Social Welfare at CFTRI as a part of National Youth Programme. The first four groups of trainees are selected from among farmers, from the rural areas of different districts of Bihar. Altogether 100 youths from various districts of Bihar will be trained under the scheme.

The Director said that the course was designed to expose and acquaint young unemployed graduates, particularly from the rural areas, to the potentials of agro-based food and allied industries. The course would attempt to create an awareness of the conditions under which such potentials could be gainfully harnessed to launch viable industries for the economic uplift of the society. The training is expected to provide the youths the knowledge and understanding of the opportunities available for self-employment.

In addition to lectures and demonstrations, the trainees would be educated about the inputs needed for launching a venture, types of assistance and facilities offered by various government agencies, banking institutions and development organizations to stimulate the growth of medium, small and cottage industries. The trainees would also be exposed to the needs and requirements of quality of raw materials, machinery, equipment and technology, and formalities to be observed for starting an industry.

Dr S. Sengupta of IIEM Honoured by INSA

Dr Subhabrata Sengupta of the Indian Institute of Experimental Medicine (IIEM), Calcutta has been awarded a Science Academy Medal for Young Scientists for the year 1974 by the Indian National Science Academy. The Prime Minister presented the medal at the inauguration of the Indian Science Congress on 3 January 1975. The award, which is made in recognition of outstanding work by scientists below 30 years, carries a bronze medal and a research grant of Rs 5000.

Dr Sengupta received the award for his work on the structure, D-, L-amino acid sequence and mechanism of biosynthesis of the cyclic peptide antibiotic mycobacillin. His studies on its structure established that the peptide, made up of 13 amino acids, contains about 50% D-amino acid residues and two γ-peptide linkages. It thus presented a unique model for the study of the mechanism of biosynthesis of heterogeneous peptides in which the ribosomal machinery on which the synthesis of homogeneous peptides is based may be implicated.

Dr Sengupta's investigations have shown that the biosynthesis of mycobacillin occurs in the soluble supernatant of the producer cell starting from L-proline followed by sequential addition of other amino acids including D-amino acids which arise from corresponding L-isomers through alanine racemase, to give finally a straight-chain product which immediately cyclizes to mycobacillin. The energy for each amino acid addition appears to be derived from the breakdown of ATP into ADP and P_2. The mechanism revealed by Dr Sengupta's work suggests a new mode of peptide bond formation in mycobacillin without the participation of aminoacyl adenylate, but through peptidation of amino acids in the peptide chain involving the breakdown of ATP. The work is of significance as a first attempt towards the elucidation of the biosynthesis of peptides containing both D-amino acids and γ-peptide linkages in the molecule.

Progress Reports

NCL Annual Report : 1973-74

The National Chemical Laboratory (NCL), Poona, has brought out its annual report for 1973-74. Against a total expenditure of Rs 9·083 million, the income of the laboratory amounted to Rs 1·150 million. The value of products produced commercially during the year on the basis of NCL know-how was Rs 65·10 million. Most of these products were substitutes for imported items. The value of foreign exchange thus saved was estimated at Rs 26·00 million. The laboratory's investigations were principally in the following areas : Petrochemicals and bulk organic chemicals; Pesticides and agrochemicals; Drugs, pharmaceuticals and fine chemicals; Organic intermediates, dyes and industrial chemicals; Utilization of plant and forest resources; Chemistry of biologically active compounds; Organic synthesis; Industrial polymers, resins and elastomers; Inorganic chemicals and catalysts; Utilization of mineral resources; Organometallic compounds; Solid state materials; Instruments technology; Enzyme chemistry and technology; Fermentation processes; and Process development and chemical engineering.

Important pesticides and agrochemicals for which the laboratory standardized processes include : Phenthoate (1 kg/batch), pentachloronitrobenzene (20 kg/batch), Menazon, Nitrofen, Endosulfan and Tetradifon.

Under a sponsored scheme a process for the preparation of papaverine hydrochloride from veratrole was developed on a laboratory scale. Papaverine hydrochloride is used in drug industry mainly as antispasmodic. It is also used along with sedaline as a hypnotic. Imports of this drug during 1971-72 amounted to 4 tonnes, valued at Rs 7·25 lakh. The product prepared in the laboratory compared favourably with the imported sample.

A two-step process for the synthesis of the intermediates required in the manufacture of benzodiazepines was standardized on a laboratory scale. The intermediates are 2-amino-5-chlorobenzophenone and 2-methylamino-5-chlorobenzophenone. Benzodiazepines possess anticonvulsant, muscle relaxant and hypnotic properties.

The technology for the preparation of expandable polystyrene beads by suspension polymerization technique was standardized on 6 kg/batch scale. The product compared well with a similar product available in the market. The process was offered for commercial utilization through NRDC.

Nitrile rubber, a copolymer of acrylonitrile and butadiene, is extensively used where oil resistance is of primary importance. The process developed in the laboratory for the medium nitrile content rubber (34% bound acrylonitrile) was demonstrated to Synthetics and Chemicals, Bombay, who have now commercialized the process at their Bareilly pilot plant. Process conditions for the manufacture of high-nitrile content rubbers were standardized (8 kg/batch).

A continuous process for the manufacture of silicon tetrachloride in a fluidized bed was developed on a pilot plant (capacity 70 tonnes/annum), and the necessary process and engineering data were obtained. Silicon tetrachloride is used in the manufacture of fumed silica which in turn is used as a filler in plastics and as a dispersing agent for insecticides. The country's demand for this chemical is estimated at 2000 tonnes/annum, valued at Rs 4 million. Silicon tetrachloride is also used for the production of ethyl silicate which has an annual demand of 100 tonnes/annum, valued at Rs one million.

Know-how for the manufacture of sodium hydrosulphite using sodium formate was developed on a laboratory scale. Sodium hydrosulphite is used in the textile, paper, sugar and leather industries and is produced using zinc and electrolytic methods. The annual demand for this chemical is 11,000-12,000 tonnes as compared to the annual production of only 8000 tonnes. The method developed at the laboratory avoided the use of zinc with no change in the quality of the product.

A continuous process for the production of titanium tetrachloride (2·5 kg/hr) by chlorination of beneficiated ilmenite in a fluidized bed in the presence of oxygen acceptors like coke at high temperature has been developed. The process is now being scaled up in a pilot plant (capacity, 150 tonnes/annum). Titanium tetrachloride is used in the manufacture of rutile grade titania. It also finds application in metallurgy and in the manufacture of some intermediates and polymerization catalysts. The country's demand for this chemical is of the order of 2000 tonnes/annum, valued at about Rs 10 million.

During the period under report 125 new cultures were added to the National Collection of Industrial Microorganisms. The total collection of non-pathogenic microorganisms required by research institutions and industries numbered over 1700.

A new catalyst was developed in the laboratory for the vapour-phase condensation of methanol and aniline to predominantly dimethylaniline. Dimethylaniline is an important chemical which finds use in the dyestuff industry and in the production of tetryl.

A continuous process for the production of *p*-toluidine by vapour phase catalytic hydrogenation of *p*-nitrotoluene was being developed under a sponsored scheme. The work on the pilot plant was completed after testing the activity of the catalyst for a period of 1000 hr. The same catalyst was found suitable for the production of *o*-toluidine. The designs for a 300 tonnes/annum plant were provided to the sponsor.

Studies on the propylation of naphthalene using sulphuric acid as catalyst were continued. The work indicated that conversions of up to 70% of naphthalene to monoisopropyl naphthalene could be obtained.

Assistance was rendered to the Hindustan Antibiotics Ltd, Pimpri, on the manufacture of vitamin C by the NCL process. Follow-up action on the implementation of the big projects for the manufacture of monochlorobenzene, hexachloroethane, chloromethanes, monoethylaniline and ethylenediamine was continued.

The total number of research papers published by NCL was 88. Three new Indian patents were filed during the year.

RRL, Jammu Annual Report : 1972-73

The annual report of the Regional Research Laboratory (RRL), Jammu, for 1972-73, published recently, reveals that the laboratory accorded priorities to its R & D programmes on the basis of socio-economic criteria and also laid special emphasis on the commercial utilization of the results of research. To help unemployed engineers and technologists set up their own small-scale industrial units, the laboratory imparted training to such personnel in its workshops, provided feasibility reports on certain projects and offered design and fabrication facilities to entrepreneurs. The 80-page (royal 8vo) report summarizes the R & D work of the laboratory in the following areas with which it is concerned : Organic chemistry; Chemical engineering; Special resources; Applied botany; Mycology and plant protection; Entomology; Phytochemistry; Fermentation technology; Pharmacology; Plant survey; and Food technology.

The laboratory has developed a solvent extraction technique for extracting cedarwood oil from Himalayan cedarwood. This cedarwood oil is extensively used in cosmetics and perfumery industry. Presently, the oil is extracted from sawdust and chips by steam distillation which is an uneconomical process. Calamus oil, used in perfumery industry and insecticidal formulations, was also extracted in improved yields by solvent oil extraction from *Acorus calamus* roots.

The steroidal alkaloid solasodine, an important starting material for the synthesis of steroidal hormones and corticosteroids, was extracted from ripe berries of *Solanum khasianum*. The method consisted in extracting the dried berries in a Soxhlet apparatus with rectified spirit followed by hydrolysis of the concentrated extract with ethanolic hydrochloric acid. Basification of the crude hydrochloride followed by crystallization yielded solasodine in pure state.

The polysaccharide present in the seeds of *Strychnos potatorum* was processed to obtain an industrial gum suitable for various industries. Pharmacological examination of the alcoholic extract of the seeds indicated the presence of a hypotensive agent.

Work was undertaken on the commercial utilization of apricot kernel oil obtained from wild apricots (*Prunus armeniaca*) which is a forest waste. Laboratory studies revealed that the kernels contained about 45% of a comparatively light coloured oil which contains oleic acid as the main component followed by linoleic acid. The composition of the oil was similar to that of almond oil and could serve as a substitute for the latter after suitable treatment. Oleic acid could be obtained in about 92% purity on bench scale by urea fractionation method. For this purpose, fat splitting studies were conducted under varying conditions to establish the optimum conditions.

Plaster of Paris suitable for thin layer chromatographic work was prepared from the substandard mineral gypsum available in the Jammu and Kashmir area. This grade of plaster of Paris used as binding material in TLC has two advantages over the material prepared from the precipitated chemicals : (i) cheaper, and (ii) easy control of particle size. The process developed for the manufacture of surgical grade plaster of Paris was released to a party at Jammu through the National Research & Development Corporation of India.

Experiments were carried out on dressing and dyeing of sheep and rabbit skins. Various species were tested for tannin content.

To meet the requirements of raw materials for paper industry, the existing resources and the newly introduced fast-growing plants require to be studied. Investigations were continued on the fast-growing young trees, viz. *Eucalyptus robusta*, *E. citriodora*, *E. seiberiana*, *Melia azedarach* and *Moringa* species. Work on the preparation of particle boards from agro-wastes like mentha marc, pine bark, *Lantana* stems and other lignocellulosic materials was carried out.

Pilot plant studies were made on the extraction of oil from both rice bran and rice germ. It was found that the bran oil (12%) has a free fatty acid (FFA) content of as high as 70% within one month of separation from rice. Oil obtained from pure germ was found to be as good as any other edible oil with an FFA content of only 3·5%. A sponsored project on the re-esterification of rice bran oil (*in situ*) for utilization in vanaspati has been completed successfully. It was found that if the bran is extracted immediately after its removal or is given a quick high-temperature treatment (80-90°C) to deactivate the lipolytic enzyme, the FFA content can be reduced considerably.

An economic method for the production of citronellol and hydroxycitronellol from *Eucalyptus citriodora* oil was perfected.

In the field of food technology, studies on processing, preservation and canning of apples, plums, cherries, walnuts and citrus fruits indigenous to the region were continued. The work relating to the evolution of improved varieties of edible mushrooms was also continued. Technical information about the method of composting and cultivation practices to be followed to get maximum yields in the production of mushroom, etc. was given to a number of parties.

During the period under report, consultancy services were rendered to forty entrepreneurs and feasibility reports were prepared for seven parties.

CSIR Support To Research

New Schemes

Synthesis and Pharmacological Evaluation of Derivatives of GABA

Gama-aminobutyric acid (GABA) as well as other amino acids have been shown to be of clinical importance, especially in Parkinson's disease. The physiological role of these amino acids is not yet clear and further study of GABA and its congeners is necessary. The search for an ideal drug for Parkinson's disease is in progress. Recently Bonta *et al.* have synthesized GABA derivatives and have found the compounds to be promising as possible drugs. In a new CSIR research scheme, Prof. K. A. Kulkarni of Ramnarain Ruia College, Bombay, proposes to synthesize newer GABA derivatives in order to provide drugs useful in Parkinson's disease. Further, it would be interesting to study the structure-activity relationship of these compounds and compare it with that of GABA. This would perhaps throw more light on (i) correlation between neurosedation and dopaminergic mechanisms; (ii) possibility of a functional correlation between the GABA system and the dopaminergic system; and (iii) possible clinical implications of this class of compounds.

Biological and Chemical Factors Affecting Establishment of Symbiosis in Legumes *in vitro*

Proteins are the basic building blocks of life and are, therefore, essential for the continued growth and development of organisms. Leguminous plants, particularly pulses, are a rich source of proteins. This is because the pulses are in symbiotic association with certain bacteria that are capable of trapping the atmospheric nitrogen and converting it to ammonia, the raw material for building up proteins and other nitrogenous compounds. It is therefore very essential to understand the various biological and chemical factors affecting the establishment of symbiosis in legumes in order to achieve the maximum conversion of atmospheric nitrogen to ammonia. The biological and chemical factors affecting the establishment of symbiosis are not fully understood. A clear understanding of these factors will enable us to improve the nitrogen-fixing ability of the legumes. It is also important to know the reasons for the inability of some legumes and almost all non-leguminous plants to fix nitrogen. In a new CSIR research scheme granted to him, Dr V. Ranga Rao, Lecturer in Botany, Sri Venkateswara College, New Delhi, proposes to study the chemical constitution of nodulating and non-nodulating legume roots, root extract as well as aerial parts to see whether there are any inhibitors in non-nodulating systems. Also, he proposes to investigate why the cereals are not able to accept the bacteria and form a symbiotic association. Tissue cultures of nodulating and non-nodulating legumes and cereals will be used to study the interactions with bacteria resulting in symbiosis. It would thus be possible to point out at what stage the symbiotic phenomenon is inhibited in different plants.

Synthesis, Chemical and Pharmacological Studies of New Tyrosine Hydroxylase Inhibitors

The role of adrenergic synapses in the Central Nervous System (CNS) is not clear. Norepinephrine may play a role in temperature control, the neuroendocrine regulators of pituitary function, the control of mood, the control of posture and motor activity. In addition, norepinephrine has been implicated in several types of mental disorders that indicate altered neurotransmitter function or metabolism, and tyrosine hydroxylase inhibitors are the only compounds which will bring about a significant decrease in norepinephrine biosynthesis. In a new CSIR research scheme granted to him, Prof. R. A. Kulkarni of Ramnarain Ruia College, Bombay, proposes to synthesize new tyrosine hydroxylase inhibitors. Apart from their potentially useful roles in the studies on the sympathetic nervous system, these inhibitors promise to be of value in the treatment of catechol-secreting tumours.

Tyre-Pavement Interaction

Due to the growing fuel prices and fuel shortage, single-track vehicles will be considerably in greater demand. Economy in running cost is only one of the aspects of the requirements of the urban user. Equally important are the considerations of safety, stability and manoeuvrability of the vehicle—characteristics which depend on tyre-pavement interaction and on which depend, in turn, the dynamic performance of the vehicle. Although considerable information is available on the characteristics of large-sized pneumatic tyres used on passenger cars and heavier vehicles, data on small-sized tyres used on scooters and motorcycles are practically nonexistent. Scooter manufacturers require reliable data on the pneumatic tyres commercially produced in the country. This basic information is essential to predict the dynamic behaviour of the vehicles and in turn to identify the need and scope of improvement in vehicle design.

The work that is being envisaged in a new CSIR research scheme granted to Prof. D. V. Singh of the Department of Mechanical and Industrial Engineering, University of Roorkee, Roorkee, is extensive in nature and includes the following tests for both scooter and motorcycle tyres : (i) free rolling characteristics, (ii) rolling characteristics with longitudinal slip, (iii) tyre traction characteristics, (iv) wear characteristics, (v) stiffness and damping characteristics, and (vi) braking characteristics with partial and optimum braking and also for locked wheel.

The results of the proposed investigations will enable tyre manufacturers to evaluate the tyre carcass structure and the deficiencies of the existing products and redesign the tyres to improve such characteristics.

Reliable tyre data are absolutely essential to analyze the dynamic characteristics (stability, manoeuvrability and safety) and to evaluate a scooter vehicle as a whole. These data, therefore, are likely to be of considerable interest to scooter manufacturers in the country. The data will enable them in the first place to select the most suitable tyres for their vehicles of existing design. They will also help them in effecting modifications in vehicle configuration as a result of which it may be possible to considerably improve the dynamic performance of the vehicles.

Creep, Analysis and Failure of Plates and Shells

Creep connotes slow deformation of solid materials over extended periods under constant load. The phenomenon is usually associated with high temperatures but depends on the material; for example, in some non-metallic materials, e. g. wood, plastic, rubber, etc., creep occurs at room temperature, whereas metals exhibit creep at elevated temperatures. In fact, every material exhibits creep at a certain temperature which may be called the 'critical temperature' for the material.

Many structures such as gas turbines, missiles, nuclear power generating equipments, oil refineries and aerospace vehicles are subjected to high temperature where the creep strain is prevalent. The material starts to flow and a highly non-linear phenomenon is experienced. The stress gets redistributed with time due to creep and the strength and stability of structural components are also affected by it. Creep may also cause an initially isotropic material to become anisotropic. Also, the failure of a part may take place at a much lower load than that predicted by ordinary type of testing. These effects pose great difficulty for the designer and it becomes essential for him to make use of the theory of creep for rational design of structural parts or machines. Hence the calculation of stresses, strains and strength of machine or structural parts with consideration being given to creep has great importance for present-day engineering and technology.

Under a new CSIR research scheme entitled 'Creep, analysis and failure of plates and shells' sanctioned to him, Dr N. S. Bhatnagar, Department of Mathematics, University of Roorkee, Roorkee, proposes to carry out research in creep problems of technical importance. Theoretical solutions will be attempted to the problems of plates and shells. The effect of anisotropy on stress and strain distribution and on rupture time will also be studied. The problems of rupture due to creep will be studied and a prediction of rupture time of structural parts under varying stress and multiaxial stress conditions will be made.

The results are expected to be of interest to the designers in the design and prediction of life-time of machine or structural parts, for example, in gas turbines, nuclear reactors, pressure vessels, and chemical plants.

Deputation Briefs

Dr N. Subramanyan of the Central Electrochemical Research Institute (CECRI), Karaikudi, was deputed to Romania under the Agreement for Scientific and Technological Cooperation between India and Romania for a period of three weeks from 18 August to 8 September 1974.

Dr Subramanyan visited the Centre of Physical Chemistry at Bucharest and had discussions with the staff engaged in electrochemical research. The following observations were made.

The electro-deposition of copper and zinc from pyrophosphate baths in the presence of various organic compounds including mercaptans was a subject of study, which included measurements of the kinetic parameters by pulse polarization. In another study, to avoid water pollution by organic compounds from a chemical industry an electrochemical method of removing pollutants, particularly triazines, was being investigated. Anodic oxidation of these substances is carried out using platinum anode and stainless steel cathode at a cell-voltage of 5 V. In another study of amine-type corrosion inhibitors in brine, an inhibition efficiency of the order of 90% was obtained. The values of inhibition efficiency obtained by galvanostatic polarization methods through extrapolation of the Tafel region and by immersion tests were not in agreement. The polarization method is found useful only in screening the inhibitors and not in reflecting the service performance.

The pitting of stainless steel and of aluminium and aluminium alloys in chloride solutions was the subject of another study. It has been found that in the case of stainless steel, the critical pitting potential is proportional to the chloride content, pH and temperature, whereas the passivation potential was dependent only on the temperature and independent of the chloride concentration and the pH and that nickel makes the maximum contribution to pitting. Factors responsible for pitting were discussed and it was pointed out that experiments carried out at CECRI had shown that the surface states of the metals played a vital part in the initiation and progress of pitting.

The development of low-chromate and non-chromate corrosion inhibitors for steel in cooling water systems was under study. The effectiveness of phosphate or hexametaphosphate in combination with small amounts of chromate and/or zinc for the industrial river water in Bucharest has been established.

Dr Subramanyan also visited the Polytechnic Institute in Timisoara and held discussions on the vibrating electrode (invented by Prof. Fascko) and its applications in polarography and to mass-transport problems in electrochemical processes. It is claimed that the limiting current is increased 15 times by the vibrating electrodes, and that in the study of fast reactions the Tafel region can be extended by employing the vibrating electrode. The problem of corrosion of deposited manganese during electro-deposition from ammonium sulphate solution containing sulphur dioxide has been analyzed and explained in terms of Wagner-Traud diagrams. In an investigation of the co-deposition of nickel and zinc, the abnormally high deposition of zinc in this process has been accounted for by the change in the potential of the zero charge of the alloy with increasing zinc concentration and also by the electrocapillary curves. The applied problems under investigation were concerned with : (i) preparation of manganese dioxide from Romanian ore dissolved in sulphuric acid, (ii) preparation of pure manganese (pilot plant stage), (iii) preparation of potassium permanganate—up to the micro-pilot plant stage, (iv) preparation of ammonium and potassium persulphates—up to the micro-pilot plant stage, (v) preparation of cuprous oxide—industrial plant, (vi) industrial corrosion problems, and (vii) preparation of electrolytic iron powder—pilot plant stage.

Dr Subramanyan also visited the pilot plant section of the Department of Chemical Engineering of the Polytechnic Institute and the Chemical Research Centre at Timisoara and attended the conference on Pure and Applied Physical Chemistry held in Bucharest.

PATENTS ACCEPTED

Indian Pat. 87957

Production of levan and related polymers by fermentation using a locally isolated microorganism

B. M. Gupta & I. V. Clifford
Central Drug Research Institute, Lucknow

Polysaccharides have many industrial, medical and agricultural uses. Certain preparations of polysaccharides (levan) have an ameliorative effect on soil structure and conserve soil moisture. In medicine, some polysaccharide preparations (dextran) have been used as plasma substitutes. Polysaccharides have been claimed to be useful in the production of icecream powders, preservatives, jams, salad dressings and in many other applications where a thickening agent is desirable. In the manufacture of paper, certain preparations of polysaccharides are used to make the finished piece of paper smoother. Other likely uses of polysaccharides are prolongation of freshness and keeping qualities of fresh food and improvement of cleansing power of dental creams and dentrifice.

The patent under reference relates to a fermentation process for the production of polysacharides using a substrain of *Leuconostoc mesenteroides* p-60. The novel feature of the process is that the substrain is adapted to grow on cane molasses as a sole source of carbon in which the bacteria do not need any added supply of carbon dioxide for the production of the polysaccharide. Tests have shown that the polysaccharide produced from molasses contains D-glucose besides D-fructose.

Laboratory investigations have been carried out so far on the production of the substance only on a batch scale (weighing 100 g or less at a time) in small conical flasks.

The likely cost of production and capital investment required to translate the process into commercial scale can be estimated only after the process is explored and the product is produced on a pilot plant scale.

The Paper Institute, Saharanpur, the Indian Agricultural Research Institute, New Delhi, and the Indian Institute of Sugarcane Research, Lucknow, have shown interest in this product.

Indian Pat. 119087

An improved method for the commercial production of rutin from *Fagopyrum esculentum*, *Fagopyrum tataricum*, *Eucalyptus macrorrhyncha* and other plants containing rutin

C. K. Atal & V. N. Vashist
Regional Research Laboratory, Jammu

Rutin (also called quercitin-3-rutinoside; 3, 3′, 4′, 5, 7- pentahydroxyflavone-3-rutinoside; vitamin P) is imported in huge quantities to meet the demand of the pharmaceutical industry. The drug is widely prescribed in clinical medicine to correct demonstrated or presumed capillary faults, i.e. abnormal capillary fragility or permeability. It is recommended in the management of patients with hypertensive cardiovascular disease, including hemorrhagic retinopathy, purpura, glaucoma and a variety of other diseases in which capillary malfunction plays an important part.

The conventional methods for preparing rutin consist in the extraction of rutin-containing plant materials with boiling methanol, ethanol or isopropyl alcohol, etc. followed by the removal of the solvent and crystallization of the concentrated extract. These methods involve several time-consuming steps. Alcohols isolate large quantities of chlorophyll and lipid materials which pose filtration and other problems and give a product with excessive green colour. Decomposition of rutin (an unstable glycoside) cannot also be avoided in the processing because of the time involved. The present patent relates particularly to an improved process for the extraction of rutin from *Fagopyrum esculentum*, *F. tataricum*, *Eucalyptus macrorrhyncha* and other plants containing rutin.

The method offers a simple, efficient and economical process for the commercial production of rutin. The plant materials, specially *Fagopyrum* species, which are normally cultivated at high altitudes in the internal ranges of the Himalayas, have now been grown at the experimental farm of the Regional Research Laboratory, Jammu. As a result of a series of experiments for their cultivation it has been found that *F. tataricum* gives very good yield. The present strain of the species yields 6% rutin on large scale trials. The cost of production is comparable to the international price.

Indian Pat. 133518

A process for making large-size clay products with improved strength

A. K. Chatterji, K. D. Dhariyal,
C. Gangopadhyaya & R. S. Rawat
Central Building Research Institute,
Roorkee

The process covered by the patent under reference relates to the production of large-sized clay products with improved strength, such as corrugated clay sheets, large-size clay tiles and pipes of wide range of diameters and lengths. A special body mix with chemical admixtures is used in place of the ordinary clay mix for making these products. The tensile strength of these products after firing is quite high and there is no warpage or shrinkage cracks during drying and firing. The corrugated clay sheets can be made by hand moulding; pipes can be made by extrusion. The transverse strength of corrugated clay sheets of size 105 cm × 60 cm and 12 mm thickness at a span of 75 cm is 240 kg and the bursting pressure of 2·6 cm diam. and 5 mm thick clay pipes is about 18·3 kg/cm^2. The crushing strength of 6 cm diam. and 14 mm thick pipes is 716 kg/30 cm length; the minimum crushing strength prescribed by BS : 1196-1944 for a 14 mm thick pipe is 364 kg/30 cm length.

The weight 30 kg/m^2 of the roof laid with corrugated clay sheets is much less as compared to that of Mangalore pattern clay tiles (54 kg/m^2). The corrugated clay sheets are easy to lay and handle and can be drilled and sawn. Corrugated clay sheets can be used as roofing material, particularly for rural housing and low-cost housing, and the pipes can be used for irrigation in rural areas. The production cost of the clay sheets is comparable to that of the clay tiles and the overall cost of the roof laid with clay sheets is less than that of clay tile roof. The process of making corrugated clay sheets has successfully undergone factory trials in two rural tile factories.

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CSIR NEWS
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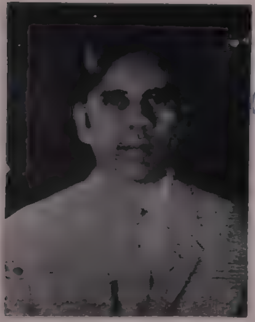
Dr G. Thyagarajan Appointed Director, RRL, Jorhat

Dr Gopalakrishna Thyagarajan, Scientist, Regional Research Laboratory, Hyderabad, has been appointed Director, Regional Research Laboratory, Jorhat. He took charge on 30 December 1974.



Born on 2 May 1934, Dr Thyagarajan had his schooling in Thanjavur (Tamil Nadu) and university education in the Osmania University, Hyderabad. He obtained his M.Sc. (first class first) and Ph.D. degrees in organic chemistry in 1956 and 1962 respectively. He carried out postdoctoral research (1964-65) in the laboratory of Prof. Henry Rapoport at the University of California, Berkeley, on heterocyclic syntheses and applications of NMR spectroscopy.

Dr Thyagarajan started his professional career at RRL, Hyderabad in 1957 and since then he has been in the CSIR service. Prior to taking up the present assignment, he was working as Assistant Director in RRL, Hyderabad. At this laboratory, Dr Thyagarajan and his team worked on research and development of drugs, pesticides and industrial organic chemicals. One of his team's major contributions is the development of indigenous know-how for the manufacture of the drugs Diazepam and Chlordiazepoxide, now in commercial production. He has carried out basic research in heterocyclic synthesis and published 30 papers.

Dr Thyagarajan's special interest lies in industrial research management. In 1970, he completed a semester's certificate course on principles of management, conducted by the Institute for Advanced Studies in the Sciences, Princeton, at the National Institutes of Health, Washington D.C. He attended a course on management for research at the Administrative Staff College of India, Hyderabad in 1973. In September 1973, he went to The Netherlands on a United Nations fellowship to participate in the first UNIDO In-Service Group Training for Managers and Executives of Industrial Research Institutes.

Dr Thyagarajan was Visiting Scientist in the National Institutes of Arthritis and Metabolic Diseases, National Institutes of Health, Bathesda, Md, USA during 1969-71. His work here was cited as scientific accomplishment of the Section for 1970.

Dr Thyagarajan was a member of Planning Group on Pesticides of the Panel on Chemical Industry, National Committee on Science and Technology. He is member-convener of the CSIR Pesticides and Agro-chemicals Research Committee. He is a recognized guide for Ph.D. in chemistry of the Osmania, Bombay, Karnatak, Marathwada, Roorkee and Kerala universities.

Shri S. Bagchi

Shri Subhrendu Bagchi, Director, Central Mining Research Station, Dhanbad, has been elected President of the Mining, Geological and Metallurgical Institute of India for the current session. Shri Bagchi is actively associated with the Institute for the last 25 years.

Shri Bagchi has been unanimously elected President of the Dhanbad Productivity Council for the year 1974-75. Shri Bagchi is intimately connected with the Council for the last several years. The Council is engaged in stimulating productivity services in the industry by providing training, consultancy and research facilities.

Application of Geophysics to Civil Engineering and Groundwater Problems

A panel discussion on 'Application of Geophysics to Civil Engineering and Groundwater Problems' was held at the National Geophysical Research Institute (NGRI), Hyderabad, on 26 December 1974. The panel provided an opportunity for exchange of ideas between the users of the results of applied R & D work in geophysics relevant to civil engineering and groundwater problems and geophysicists, geologists and other scientists engaged in R & D activities. The panel discussions, organized under the aegis of the Indian Geophysical Union, were inaugurated by Dr D. S. Deshmukh, Chief Hydrogeologist, Central Ground Water Board. The panel included Shri C. Karunakaran, Director General, Geological Survey of India, Dr K. V. Raghava Rao, Director, Central Ground Water Board, Dr K. R. Karanth, Director, State Ground Water Board, Andhra Pradesh, and scientists of NGRI. Representatives of the State Department of Geology, Government of Madhya Pradesh, Andhra Pradesh Public Works Department, South Central Railway and a number of other organizations and local bodies participated.

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Presiding over the discussion, Dr Hari Narain, Director, NGRI, said that about Rs 500-600 crore are lost every year in drought relief works and on account of soil erosion, crop losses, etc. These losses could be minimized through proper application of geophysics. NGRI has already initiated a project on scientific management of groundwater in collaboration with B. f. B. of the Federal Republic of Germany with a view to water-budgeting. on a regional basis.

Inaugurating the discussions, Dr D. S. Deshmukh emphasized upon the concept of integrated development and resource evaluation for the socio-economic development of the country. He indicated that the groundwater resources of the country were plentiful. He appreciated the basic maps prepared by the Geological Survey of India and emphasized the importance of the study of underground water movement, its direction, etc. He suggested that extensive pumping tests be carried out to know the potential of an aquifer. The Central Ground Water Board has undertaken studies in various parts of the country, a notable example of which is the study in Jaisalmer area of Rajasthan. In order to augment irrigation facilities the Central Ground Water Board has extended cooperation to other agencies including the UNDP project.

Shri C. Karunakaran dealt with the role of geology and Geological Survey of India in the development of groundwater resources of the country. He said that geophysical data would help in assessing the problems in their proper perspective during the execution of civil engineering projects.

Prof. Agarwal gave an account of consultancy services rendered by the Roorkee University in measurement of movements along faults which are important in the design and construction of dams and underground tunnels, etc. The NGRI scientists briefly mentioned the consultancy services rendered to various organizations in locating groundwater and selection of dam sites, etc. along river courses.

The user organizations appreciated the assistance obtained from the earth science organizations. The need for possible reduction in charges for such consultancy came up for discussion. The discussions dealt upon the boundaries of utility of geophysical methods and outlined areas where geology and geophysics could work together in order to achieve best possible results in solving the problems of civil engineering and groundwater in project areas.

Dr S. Balakrishnan, Secretary of IGU, earlier welcomed the participants and detailed the efforts made so far towards locating the groundwater sources.

Railway Sanitation : Seminar at NEERI

As one of its national tie-up activities with the Ministries of the Government of India, the National Environmental Engineering Research Institute (NEERI), Nagpur, organized a two-day seminar for civil engineers and medical officers of the Ministry of Railways on 16 and 17 January 1975 at Nagpur to discuss the problems of sanitation in railways. About twenty participants representing Railway Board directors, chief engineers and chief medical officers of various zonal railways attended the seminar. The Railway Staff College at Baroda was also represented. With heavily loaded passenger trains, there is a potential health hazard from the discharge of human wastes on rail tracks, especially when the trains are at or near a station. This hazard is well recognized but no measures could yet be evolved to obviate the hazards.

The seminar focussed attention on such problems as : (i) sanitation of railway tracks, (ii) excreta disposal at wayside stations, (iii) treatment and disposal of waste waters from small sewered railway colonies, (iv) bacteriological quality of drinking water, (v) chlorination and watering of railway carriages, and (vi) elimination of mosquitogenic conditions.

While inaugurating the seminar Shri D. P. R. Cassad, a well-known civil engineer and industrialist of Nagpur, impressed upon the participants the need for such interaction between railway officials and a research institute. Dr S.S.L. Verma, Director (Health), Railway Board, who was the coordinator for the seminar, explained the genesis of the seminar and the advantages that will accrue out of the personal visit of the top officials of the railways, so that they could see for themselves the activities of the institute and take advantage of the know-how developed in the field of water supply and sanitation.

While welcoming the participants on behalf of Prof. N. Majumder, the Director, Dr G. K. Seth of the laboratory expressed the hope that such get-togethers between the different ministries of the Government of India and NEERI would be very fruitful for transfer of technology from the laboratory to the field.

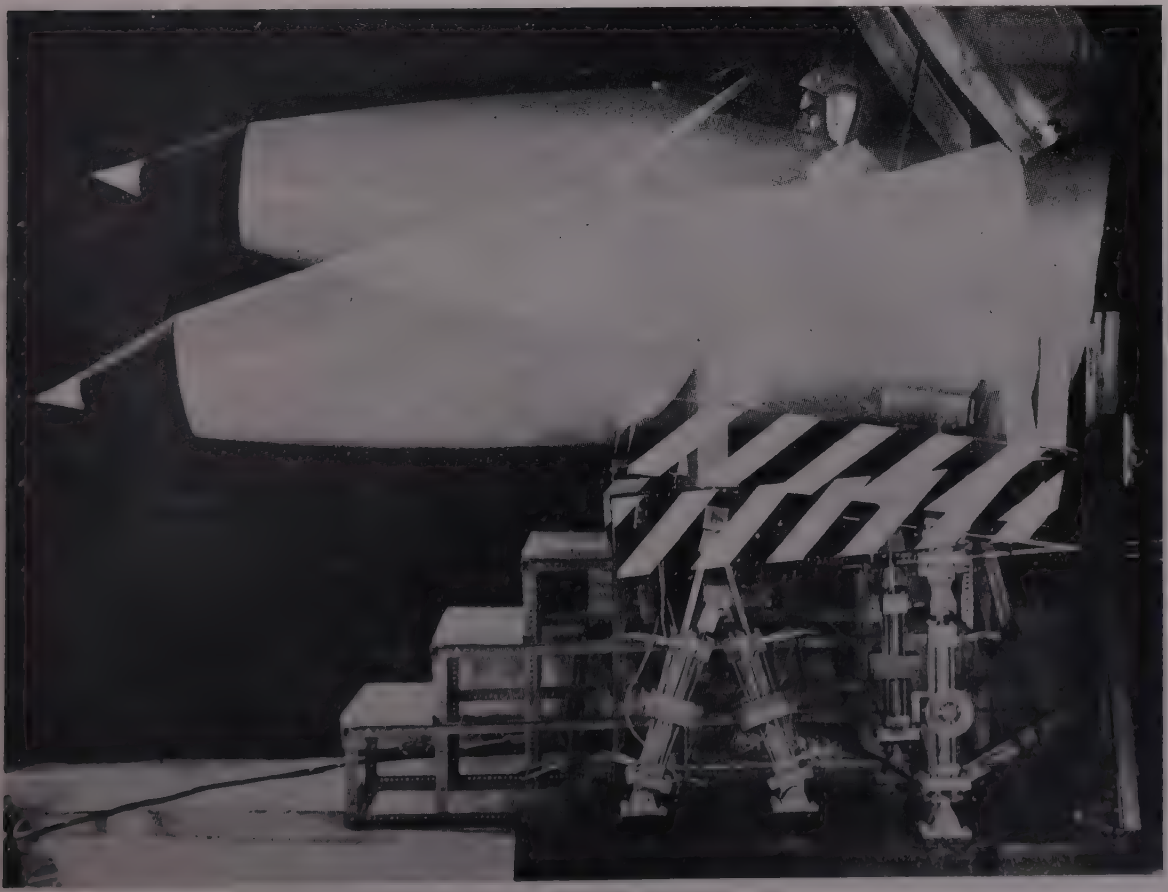
Training Course in Petroleum Refining Technology at IIP

A short-term training course for newly recruited chemical engineers of the Indian Oil Corporation Ltd (IOCL) was conducted by the Indian Institute of Petroleum (IIP), Dehra Dun, during October 1974 - January 1975. This was conducted at the request of IOCL, and the syllabus was designed in consultation with IOCL, keeping the job requirements of these engineers in view. Thirty-three trainees participated in the course. The faculty for the course consisted largely of IIP scientists. For certain specific topics, however, experts in the fields were drawn from outside organizations like Engineers India Ltd and Geo-Miller Industries.

The institute has conducted similar courses for the Indian Petrochemicals Corporation Ltd and the Engineers India Ltd in the past.

Flight Simulation Laboratory for Man-Machine Studies Set up at NAL

A flight simulation laboratory for investigations on pilot-vehicle interaction has been set up at the National Aeronautical Laboratory (NAL), Bangalore. Problems associated with real-time 'man in the loop' situations are of varied complexity, and the study consists of simulating the vehicle dynamics whose states are used to excite the pilot in appropriate sensory media, viz. visual cues (flight instruments), vestibular cues (motion of pilot head), proprioceptive cues (stick feel) and aural, and derive the pilot outputs which control the vehicle. The simulation configuration can be planned to yield pilot describing functions, vehicle handling quality, stability augmentation system design, artificial feel design, crew training and a host of other pilot-oriented design data. However, each situation needs a different configuration to obtain adequate accuracy and realism of simulation. Following are some of the simulation facilities currently in use.



Motion-based simulator with pilot in take-off attitude

Motion-based Simulator for an Aircraft

The simulator consists of a fibreglass aircraft cockpit, mounted on a 3-degree of freedom motion platform having 1-ft vertical heave, and plus minus 3 degrees pitch and roll. The cockpit has a pilot seat, a throttle lever, stick with longitudinal feel and gearing which are duplicates of the actual aircraft and datum trim mechanism with nose and tail trim. The various 10-turn, 2-needle servo-driven flight instruments are tail angle, bank and turn indicator, altimeter, true air speed indicator, heading angle, artificial horizon, engine rpm and the rate of climb indicator. The pilot controls in electrical form go to 50 amplifier analog computer. The longitudinal flight equations are globally simulated with various non-linear function blocks, viz. density-altitude function, dynamic pressure function, the engine thrust generator which accepts altitude, Mach number and fuel flow. Outputs are fed to servo-indicating instruments in the cockpit and to the motion computer. The motion computer differentiates the rate of climb and provides the heave signal after washout, and subsequently generates the position command for the four-position control loops of the electro-hydraulic motion platform. The static and dynamic derivatives used in flight equations were obtained as external description by invoking identification methods to short-period records of the aircraft.

The trim curves obtained in the *V-h* plane for the simulator compare well with manufacturer's trim curves and dynamically the short period and phugoids are accurately duplicated.

Currently the simulator is being used for obtaining gross performance data checks of an aircraft. In future the unit is intended as an extension of the wind tunnel activity at NAL so that pilot interaction aspects of models under test can be taken up on the basis of wind tunnel generated data. This project is being supported by ARDB.

Fixed-Base Simulator

This has been built to perform pursuit and compensatory tracking tests on human pilots, and consists of a seat, a two-degree of freedom manipulator with electrical output, and a visual input through a pilot-controlled optically projected horizon bar on a screen. Low-pass random noise of the clear air turbulence type is used to disturb the pilot, and pilot is identified from pilot input-output pair. This has been successfully used to postulate an autoregressive moving average model for human pilot. Nearly 500 piloted runs have been completed.

Artificial Feel Simulator

An electrohydraulically actuated single-axis artificial feel has been conceived and built. The feel system is conceived as equivalent to second-order mechanical system of mass damping and spring type, where these parameters are controlled electronically from flight data. Thus a *g* feel would consist

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Cockpit layout with servo-drivern flight instruments

of the spring constant of feel system varying as a function of measured *g*. Investigations are being carried out to effectively and efficiently match the flight and feel parameters from a manual control standpoint.

Progress Reports

NML Annual Report : 1972-73

The annual report of the National Metallurgical Laboratory (NML), Jamshedpur, for 1972-73, published recently, shows that the R & D programmes of the laboratory have been directed towards generating a continuous dialogue between the researchers, users and industries for identification and solution of problems pertaining to various disciplines of metallurgy against the background of industrial and national needs. As a result, an increasing number of investigations is being sponsored at NML by metallurgical and mineral industries who are also interested in exploiting the processes/products developed by the laboratory.

Field trials of the telecommunication cables made from the aluminium alloy conductor developed by the laboratory have given highly satisfactory performance and steps are being taken for commercial-scale production and application in place of copper cables. The first phase of work relating to the development of a suitable lining material for L-D converter of the Rourkela Steel Plant was completed and the findings were communicated to the plant authorities.

The laboratory has developed techniques for the recovery of cadmium and tin from the spray booth powder obtained as a waste in the manufacture of selenium rectifiers. It was estimated that by recovery treatment on the basis of 50 kg/day of waste cake, material worth over Rs 5 lakh/annum could be recovered at a cost of Rs 3·50/kg with a total capital investment of less than one lakh rupees. The process was ready for transfer to industry.

The laboratory has developed the technology for the recovery of zinc metal (more than 99·90% pure) from galvanizers' dross. The annual turnover of galvanizers' dross is estimated at 18,000 tonnes from which 93% of the zinc content can be recovered at less than Re 1·00/kg with a total capital investment of around Rs 7 lakh.

Studies were carried out by NML on the development of high-alumina refractories from bauxites, viz. Shevaroy white and red, Katni white and red, and Jammu and Kashmir bauxite. The studies showed that these ores were suitable for making good-quality high-alumina refractories.

The laboratory has developed a beta-ray back-scattering technique which can be utilized for determining the concentrations of solutions of lead nitrate, lead acetate, barium acetate, silver nitrate, barium chloride, cadmium chloride, ferric chloride, copper nitrate and copper sulphate. The back-scattering is very sensitive to the atomic number of the scatterer and, therefore, the detection of high atomic ions in a medium of low atomic number may be done easily using this technique.

Production of sponge iron in rotary kiln was continued by NML with the materials received from NMDC, SICOM and TISCO. Large-scale trials were conducted in an 0·8-tonne electric furnace on the melting of sponge iron. The melting characteristics were studied and the method of feeding the sponge was standardized. Different grades of steel with sulphur and phosphorus in the specified range were produced.

At the request of the Heavy Machine Building Plant (HMBP) of the Heavy Engineering Corporation, Ranchi, the laboratory developed the technology for coating aluminium on the electrodes of the aluminizing plant of the Bharat Aluminium Co. (BAC). The coated electrodes were subsequently welded to the aluminium strips successfully by HMBP and met the rigid specifications of the collaborators of BAC.

The pilot plant for the production of electrolytic manganese was run successfully in several organized campaigns to collect operational data on reduction, leaching, purification and electrolysis with low- and high-grade ores. During these runs about 500 kg of electrolytic manganese metal were collected. More than 1500 kg of manganese metal was sold to outside organizations.

The pilot plant for the production of dense carbon aggregate and soderberg paste suitable for use in ferro-alloy furnaces was put into service by the laboratory. The plant has fulfilled almost all the design expectations and except for the electrical tunnel kiln, all the other equipment were put on run and standardized.

The Andhra Pradesh Industrial Development Corporation was provided with consultancy services by NML in the setting up of a graphite beneficiation plant for the manufacture of graphite crucibles. In connection with the construction of the railway system in Calcutta the Metropolitan Transport Authorities (Railways) have requested the laboratory to act as consultant in regard to the underground corrosion problems due to leakage.

Forty-four research papers were published and 34 sponsored investigations were completed during the year.

NML Standard Reference Samples for Accurate Chemical Analysis

Standard samples are of vital importance for the accurate determination by classical analytical methods as well as by instrumental analysis. Bulk of the standard samples is being imported to meet the demand. Preparation of standard reference samples has been undertaken by the National Metallurgical Laboratory (NML), Jamshedpur, to serve the requirements of industries. So far, 15 standard samples have been prepared and supplied to various research and educational institutions and industries.

Standard reference samples of cast iron, plain-carbon steels, low-alloy steels, stainless steels, high-carbon ferrochrome, ferro-silicon, brass (60:40), iron ores, manganese ores, limestones, fluorspar, etc. are available for sale.

For requirements of standard reference samples the interested parties may contact : The Director, National Metallurgical Laboratory, Jamshedpur 831007.

Conference Briefs

At the invitation of the Institut de la Vie, Paris, Dr R. L. Datta of the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, participated at the world conference on "A plan of actions for mankind—needs and resources : methods of pre-vision" at Paris from 9 to 14 September 1974. About 250 delegates from 36 countries participated. The recommendations of the conference related to economic science and problems of growth, long-range mineral resources and growth, long-range energy resources and growth, biological balance and thermal modifications, design of global system models and their limitations. Dr Datta gave four lectures giving the conditions of the developing countries with respect to energy situation and urging the delegates to take note of them in framing the plan of actions for mankind.

Emphasis was laid on a plan for a better quality of life rather than for an ever increasing quantitative growth. The shortcomings of modern growth were stated to be due, among other factors, to growth not always reducing inequalities, which in turn are, to a great extent, due to insufficient financial transfers, specially in the field of international cooperation. In an overall assessment of the situation the planned trend should lead to decelerated materials growth rate in the developed countries and to decelerated population growth rate in the developing countries. More efficient use of materials, lowering rate of growth of demand of manufactured goods, specially in developed countries, development of technology of utilization of raw materials of extremely low grade and of waste utilization by recycling, it was stated, would lead to healthy trends. Such steps would lessen demands for new raw materials by 25-60%. Eighty-five per cent of energy is consumed by the 25% of world's population of the developed countries, resulting in high GNP. The world's annual growth rate of population is 2% and of energy is 1%. This has to be reversed. Agro-industrial complex is a useful concept in this direction. A change of pattern in the use of conventional fuels in transport and household is to be effected. Nuclear fast breeders will open up tremendous amount of energy in future. Solar energy and fission energy, however, will be the main sources of energy in future. Wind, geothermal and tidal energy will have localized applications. Hydrogen will be a very good secondary fuel since its use is ecologically neutral, it is applicable for transport and household purposes and its transport in pipelines is cheap. A nuclear plant produces 2 kW of thermal energy for every kilowatt of electrical energy; a hydroelectric or tidal power plant releases 1/15 to 1/29 of heat. The concentration of thermal effluents in small areas will significantly increase the temperature which will be responsible for the local warming up of cities or industrial zones. This may influence local wind circulation specially at the land-sea interface. If the economic growth of the world continues to increase exponentially and the size of the electrical power plants increases at the same rate (e. g. up to 50,000 MW), we may expect significant modifications of meteorological circulation associated with this great production of power. In aquatic problems, this rise of temperature will influence metabolism, oxygen requirement, behaviour, growth, migration, reproduction, parasites and productivity. A world model encompasses the processes that are needed for 'man-environment' relationships. Such processes are global, geological, geochemical, evolutions in hydrosphere including man's own evolution, and, above all, the history of development of human society. The final goal of all the studies of the global model is the construction of corresponding simulation systems that would make possible an analysis of different variants of the global, technical, economic and social activities of man, and their interaction. The world model will be an instrument that will make it possible to evaluate changes in global processes that will result from the implementation of the measures that are included in a plan of actions. For example, should the production of energy by man's activity continue at the current rate, then by the year 2030, humanity will be producing 4% of the energy that enters the earth as solar radiation. The consequence of this is serious. The existence of glaciers in the antarctic will become impossible and would lead to an increase of level by 80 to 140 m, and vast fertile territories will be inundated. In the models those that describe the direct interaction of man with environment are significant. For example, each inhabitant of the planet must have x kg of cereal, y kg of hydrogen, z kg of fat, etc. Let us say that information on the average volume of crops, loss due to erosion, amount of fodder per kg of animal protein and the like is available and the estimate of their expected change over time is known, then the land that is required could be estimated as a result of demographic forecast. A description of interactions among the elements of the world economic system is also needed. The existence of mankind is possible so long as the environment's main characteristics do not undergo substantial alternations during a period of time. However, the parameter of technological progress may, when superimposed on such models, bring about unexpected results. It may be possible to produce an artificial environment for human habitation; such an environment may be even better for the adaptation of life of man.

CSIR Scheme to Help Scientists Set up Industries

About six months back the Council of Scientific & Industrial Research launched a scheme for providing certain facilities to CSIR scientists, technologists and engineers for setting up their own industries based on CSIR know-how, either individually or in collaboration with others [*CSIR News*, **24** (1974), 90]. The objective of the scheme is to create a cadre of scientist entrepreneurs to experiment with new ideas and methods of organization and to facilitate transfer of technology.

So far, thirteen scientific and technical personnel have availed themselves of the facility under this scheme for setting up industries. The particulars of the scientists availing themselves of the facilities and the projects taken up by them for utilization are as follows :

Personnel	*Projects*
1. Shri Ved Prakash Scientist National Physical Laboratory (NPL), New Delhi	(i) Vacuum gauges (Penning and Pirani type) (ii) Vacuum leak detector (iii) Film thickness monitor (iv) Synthetic optical crystals of rare earth fluorides
2. Shri T. R. K. Menon Foreman, NPL, New Delhi	(i) Piezoelectric transducers (ii) High voltage ceramic capacitor
3. Shri D. C. Sharma Scientist, NPL, New Delhi	Silver-impregnated graphite (SIG) relays
4. Shri V. K. Choudhury Senior Scientific Assistant (SSA) NPL, New Delhi	
5. Shri S. S. Hanspal Scientist, NPL, New Delhi	Manufacture of ferrite components
6. Mrs Shanta Naseem SSA, Regional Research Laboratory (RRL), Hyderabad	Methyl benzene sulphonate
7. Dr G. C. Jain Scientist Central Salt & Marine Chemicals Research Institute, Bhavnagar	(i) Iodized salt (ii) Cattle licks
8. Dr N. J. Paul Scientist, Central Electrochemical Research Institute (CECRI), Karaikudi	Aluminium alloy anodes for cathodic protection
9. Shri R. Subramaniam Scientist, CECRI, Karaikudi	
10. Shri K. Naganathan SSA, CECRI, Karaikudi	
11. Shri V. Kapali SSA, CECRI, Karaikudi	
12. Shri R. Thangappan Scientist, CECRI, Karaikudi	Titanium substrate insoluble anodes
13. Dr N. M. Singh Scientist, Technology Utilization Division, CSIR, New Delhi	Bisphenol A

CSIR Support To Research

New Schemes

Alkoxides and Allied Derivatives of Various Elements

Apart from theoretical interest, metal alkoxides and their derivatives are finding considerable applications in ceramics, paints, etc. For example, mixed oxides of lanthanons, obtained from double alkoxides, have proved to be of great value in ceramics.

A new CSIR research scheme sanctioned to Prof. R. C. Mehrotra (Chemistry Department, Rajasthan University, Jaipur) as principal investigator aims to synthesize metal alkoxides and their derivatives which are normally not accessible by any other route. Comparative studies of M-S-C, M-O-N and M-N-C bonded derivatives would also be undertaken. Double alkoxides of various elements (groups III-V) with alkali metal alkoxides and of lanthanons with aluminium and gallium alkoxides would be synthesized. Structural details of these derivatives would be worked out with the help of spectroscopic techniques. Attempts will also be made to explain the apparently covalent behaviour of these derivatives which appears to be very interesting and intriguing particularly in view of the strongly electropositive character of elements involved, viz. the alkali and alkaline earths.

Metals, especially transition metal alkoxides, and their various analogues like M-S-C, M-O-Si, M-O-N and M-N-C bonded derivatives would be synthesized and characterized structurally. This general comparative investigation would help in assessing the factors affecting the relative affinity of ligand atoms, mainly oxygen and sulphur with metals, and their variation with the nature of metal concerned. Physico-chemical data in aqueous system would be helpful here.

Attempts will be made to explore the potential applications of the interesting derivatives synthesized under the proposed programme for various purposes including nitrogen fixation.

Seed Mycoflora of Oilseed Crops and their Control

Oilseed crops occupy about one-tenth of all the cultivated land in India. Rape, mustard, linseed, groundnut, sunflower and soybean are the important oilseed crops, and the country suffers considerable losses due to damage caused to them by a number of diseases appearing in the field as well as deterioration of seeds under storage due to the diseases of grain. In a new CSIR research scheme sanctioned to Dr S. Chandra, Department of Botany, University of Allahabad, Allahabad, it is proposed (i) to study the seed-borne pathogens responsible for the diseases appearing in the field and to devise methods to control them; and (ii) to study the seed-borne pathogens responsible for the diseases of the seeds themselves in storage and to devise methods to control them.

Studies on Glycerogalactolipid Hydrolyzing Enzymes in Brain

A precise knowledge of the metabolism of several chemical substances found in brain is a prerequisite for understanding the function of this important organ. The presence in brain of a new class of compounds—the glycerogalactolipids—has been shown in recent years. It has been shown that rat brain possesses all the enzymatic machinery to synthesize and degrade the galactolipids. It has also been shown unequivocally that the galactolipids are part and parcel of myelin membrane and in fact these lipids may be used as markers for myelin metabolism. It would therefore be of considerable interest to carry out a detailed study of the enzymes involved in the metabolism of these brain glycerogalactolipids at various stages of the life span of an animal since these activities can be correlated with deposition or otherwise of the myelin membrane.

In a new CSIR research scheme sanctioned to Dr K. Subba Rao, Reader, Department of Biochemistry, Banaras Hindu University, Varanasi, it is proposed to carry out a detailed study of some glycerogalactolipid hydrolyzing enzymes in brain at various stages of development. The specificity of two enzymes, viz. alpha-galactosidase (acting on digalactosyl diglyceride, DGD) and galactolipase (acting on both monogalactosyl diglyceride and DGD), to glycerogalactolipids will be tested, and the levels of these enzymes at different stages of brain development will be determined. It is also proposed to study the galactolipid hydrolyzing enzymes in the brain of animals exposed to varying periods of nutritional stress. The results of the study are expected to throw light on the formation of myelin membrane and subsequent turnover of its constituents under various conditions.

Studies on Riboflavin Formation in *Eremothecium ashbyii*

Though a good deal of information is available on the biosynthesis of riboflavin by microorganisms, very little is known about the origin of the ribityl side chain of the vitamin and the intermediates between the well-established guanine precursor and 6,7-dimethyl-D-1-ribityllumazine.

Under a new CSIR research scheme granted to him, Prof. V. V. Modi (principal investigator), Department of Microbiology, M. S. University of Baroda, Baroda, proposes to study the formation of riboflavin using an ascomycete *Eremothecium ashbyii*. The investigations in this laboratory have shown that in addition to guanine, ribitol plays an important role in flavinogenesis, and that ribose-5′-phosphatase, ribose reductase, ribitol kinase and GMP-nucleosidase are responsible for providing early precursors to the organism for riboflavin formation.

Under the new scheme the investigator proposes :

(1) To study the role of ribitol kinase, ribose reductase, GMP-nucleosidase and ribose-5′-phosphatase in providing the early precursors for riboflavin synthesis and to purify and characterize these enzymes.

(2) To accumulate various intermediates by mutation studies and by the use of antimetabolite, and explore the kinetics of their incorporation into riboflavin molecule. This will involve the use of 8-azaguanine and aminopterin, since they have been shown to specifically effect riboflavinogenesis.

(3) To study the mechanism of riboflavin oversynthesis by changing the empirical conditions and other limiting factors.

(4) To change the temperature of incubation and effect changes in the riboflavin production.

PATENTS ACCEPTED

Indian Pat. 113616

A process for the synthesis of 3, 8-disubstituted 4-oxo-perhydro (1,2.c)-piperazino-pyrimidines

(Km) R. Saxena, R. K. Chatterjee, R. N. Iyer, A. B. Sen & N. Anand
Central Drug Research Institute, Lucknow

The patent covers the process of synthesis and antifilarial activity of a new antifilarial agent, 3,8-disubstituted 4-oxo-perhydro (1, 2, c)-piperazinopyrimidines (Centperazine).

At present diethylcarbamazine is the drug of choice for the treatment of filariasis. It is however effective only against the microfilariae and has very limited action on adult worms. The 'allergic' symptoms associated with its administration are further hindrances in its use in mass chemotherapy. Centperazine has been found to possess high microfilaricidal and significant macrofilaricidal action against *Litomosoides carinii* in cotton rat (*Sigmodon hispidus*). A comparative evaluation with diethylcarbamazine of its efficacy has shown that it possesses more prolonged action. The compound appears to affect the reproductive potential of the female worms. It has chemoprophylactic action on the infective larvae. The minimum effective dose of this compound in cotton rat orally is 1·5 mg/kg × 6 days and intraperitoneally 1 mg/kg × 6 days. Oral LD_{50} in mice is 1250 mg/kg, in cotton rats 550 mg/kg and in albino rats 600 mg/kg. Intraperitoneal LD_{50} in mice is 550 mg/kg. in cotton rats 300 mg/kg and in albino rats 500 mg/kg. The therapeutic index comes to about 300. In comparison to the standard drug diethylcarbamazine it is thus 5 times more active.

Centperazine is devoid of any significant effect on CNS except for antireserpine activity. There is no significant effect on the autonomic and cardiovascular systems at several times minimum effective dose. It possesses significant antihistaminic and antiinflammatory activities (added advantages in the treatment of filarial symptomology). Chronic toxicity studies carried out in albino rats and monkeys of both sexes, extending over periods of 3 and 6 months respectively, have shown the compound to be very safe.

Indian Pat. 126354

A process for obtaining useful steroids from a new plant source

Sukh Dev, V. D. Patil & U. R. Nayak
National Chemical Laboratory, Poona

The invention relates to the extraction and isolation of steroidal compounds from the plant species belonging to the genus *Commiphora* (Fam. Burseraceae). The compounds so isolated possess physiological activity and are also valuable intermediates for the preparation of many other pharmaceutically important compounds.

The method consists in extracting the gum oleoresin with a suitable organic solvent to furnish a product free from carbohydrates. The soluble material is processed further to remove the essential oil present and the residue separated into various components. Alternatively, the resin is saponified with alkali and the non-saponifiable portion separated into its constituents. In this way, cholesterol, a trihydroxy cholestenone and two isomeric pregnane steroids are isolated besides sesamin and other diterpenoids. Although the pregnane steroids have been synthetically prepared earlier, this is the first time they have been isolated from a natural source. Furthermore, these compounds have been obtained in good yields (up to 3% on weight of oleoresin) by fairly simple methods, thereby making these oleoresins a cheap source for these pregnane steroids.

The pregnane steroids, so obtained from *Commiphora* species, can be suitably modified by simple steps into other steroidal drugs of androgens/estrogens type which are very valuable in medicine.

PATENTS FILED

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1957/Cal/74 : Two mechanical adapter devices to improve the efficiency of Hale's water sampler, S. P. Anand—NIO, Panaji.

1958/Cal/74 : Improvements in or relating to the immersion deposition of nickel on mild steel for subsequent deposition with copper, B. A. Shenoi, R. Subramanian & R. Venkatachalam—CECRI, Karaikudi.

1594/Cal/74 : A process for the manufacture of processing aid for natural and synthetic rubber from cashewnut shell liquid, B. Banerjee, N. P. Suryanarayana & C. S. Inamdar—IRMRA, Bombay.

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Industrial Liaison, Information and Extension : Workshop and Training Course at SITRA

A one-week Workshop and Training Course for scientists working in the field of industrial liaison, information and extension in CSIR laboratories was held from 23 to 28 December 1974 at the South India Textile Research Association (SITRA), Coimbatore. Thirty-two scientists from national laboratories and Technology Utilization Division of CSIR Headquarters participated.

Shri K. Sundaram, Chairman, Indian Cotton Mills Federation and Vice-Chairman, Council of Administration, SITRA, in his welcome address mentioned the importance of transference of technology for making available the benefits of scientific and technological developments to the industry. The cooperative research associations are in a favourable position from this point of view as they have ready customers in industry for the processes and products developed by these associations. Giving a brief account of SITRA's developments which have been commercialized, Shri Sundaram stated that the degree of success attained by SITRA had shown that the delivery system of technologies was reliable and that the information system for feedback to the laboratory was satisfactory. Referring to the proposal for levy of a cess on all industries for research and development, he expressed doubts if it would fulfil the desired objective. Shri Sundaram pointed out that imposition of cess introduces an element of compulsion which is not conducive to cooperation between research and industry. He mentioned that the Cooperative Research Associations in the field of textiles had done good work and formation of such associations should be extended to other industries as well.

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, in his inaugural address, stressed the need for forging closer links of communication between the industries and the research organizations. He emphasized that for efficient transfer of know-how it is necessary that the technology is fully developed and is supported by engineering, economic and market data. Whenever necessary, particularly in the case of complicated and expensive technologies, the expertise and services of suitable engineering design and consultancy organizations may be utilized. There is also need for an effective setup for dissemination of technical information to the users. The Council is already supporting a Technical Information Centre for Chemical Industry at Bombay. It is proposed to establish such information centres for food industry at Mysore, for leather industry at Madras and for aeronautics at Bangalore. An organization may be set up at the national level to manage and monitor the working of these information centres. He desired that CSIR may consider organizing technology awareness services among the industries and users of technology. Referring to the remarks of Shri Sundaram regarding the proposed levy for R & D, Prof. Nayudamma said that the National Committee on Science and Technology has identified some priority technological tasks to meet the country's economic, industrial and social needs. Implementation of this programme would need funds and the industry should cooperate to contribute.

Shri Baldev Singh, Chief, Technology Utilization, CSIR, in his introductory remarks, dealt with the objectives of the workshop and the training course. He said that the 'technology' needed by the industry is quite different in nature and content from the 'know-how' developed in the laboratory. The laboratory know-how needs many inputs like upscaling, engineering and market research before it can be accepted for commercialization. The laboratories should have capability and facilities to supplement their know-how with such other components as may be required to convert it into exploitable technology. It is here that the industrial liaison and extension wing of the laboratory has to play an important role. He pleaded for an efficient 'delivery system' for know-how developed in the laboratory. Another factor responsible for lack of appreciation of the work of the laboratory by the public in general and the industry in particular has been the fact that they are not adequately informed about the achievements. Shri Baldev Singh stressed the need for cultivating close contacts with the industry for giving wide publicity to the results of research, particularly among the users of technology.

In his key-note address, Shri K. Sreenivasan, Director, SITRA, mentioned that the relationship between the growth of science and industrial development depends on a number of factors such as cooperation between laboratories and industries, socio-economic climate for application of science for industrial production, social compulsions and the organizational pattern of research and industry. Keeping in view the limited availability of resources and the socio-economic needs of the nation, he pleaded for allocation of priorities among the selected areas of critical importance. Another factor which stood in the way of transfer of technology is the lack of organizational set-up for an objective evaluation of processes and the provision of engineering skills and financial inputs necessary for scaling up these processes to commercial form. Regarding import of technology, Shri Sreenivasan stated that foreign collaboration may be resorted to in areas where imported technology is cheaper and is likely to accelerate the pace of industrialization. A time has come when at least certain areas of technology should be reserved for indigenous development and no foreign collaboration should be permitted in such areas. The research institutes are required to make positive contributions towards the industrial and economic development of the country in such an environment, he added. This can be achieved through active research in the laboratory on the one hand and the ability of the scientist specializing in extension work to sell technology on the other. The extension worker therefore has to have a clear understanding of the industrial and social circumstances in India, Shri Sreenivasan concluded.

Workshop

At the two sessions held on 23 and 24 December 1974, delegates from 23 laboratories presented their 'status reports' in the field of industrial liaison, information and extension, staff structure and the problems being faced by them. The discussion that followed the presentation of the reports brought out certain areas where further inputs were required in order to organize and strengthen the industrial liaison and extension activity of the CSIR laboratories. At the closing session the following recommendations were adopted :

(1) Technology transfer is one of the major objectives of CSIR and its constituent laboratories. It is, therefore, imperative that the activities of the scientists in this area receive adequate recognition in the broad performance of the laboratory's work and are accorded status at par with the R & D activities of the laboratory. In some, it has been relegated to a secondary level. It is also observed that there is no functional uniformity in this area in the laboratories of the Council. The title given to the area of work differs from laboratory to laboratory and also at the CSIR Headquarters. Considering these factors, the workshop recommended that a committee may be constituted by CSIR to examine and recommend : (i) a uniform nomenclature for this area; (ii) staffing pattern for each laboratory including job description; (iii) recruitment policy; (iv) assessment and promotional avenues; and (v) additional inputs required for further effective development of an area in each laboratory as, for example, the setting up of design engineering and testing facilities.

(2) In order to improve the utility and effectiveness of the services, it was felt that organizing training and refresher courses in the following areas was necessary for the concerned scientists : (i) preparation of feasibility/project techno-economic survey reports; (ii) market intelligence, survey and assessment; (iii) monitoring of research projects; (iv) costing and project budgeting; and (v) mass communication.

It was also recommended that the opportunities for such training may be provided in and outside the country.

(3) Owing to continual increase in the cost of raw materials, man-hours and other inputs it is difficult to estimate the actual cost of sponsored projects. Procurement of raw materials and components and appointment of staff in a time-targeted project present some problems. It was recommended that guidelines for 'sponsored research' may be modified accordingly.

(4) Though the impact of CSIR and its laboratories on the industrial, economic and social development of the country is quite significant, it is generally not appreciated to the desired extent by the people because the services rendered by CSIR and its laboratories and their capacity and capabilities are not properly projected. The workshop therefore recommended that : (i) an exhibition of products/processes/techniques/know-how developed and available in CSIR laboratories be held in Delhi in January 1976 and in other important centres in subsequent years, in collaboration with the industries utilizing CSIR know-how and NRDC; and (ii) CSIR may arrange a conducted tour of the representatives of mass media to the national laboratories at least once a year.

(5) The workshop expressed concern on the non-utilization of many of the processes developed in CSIR laboratories. The workshop recommended that each laboratory may periodically review the processes/patents on its roaster in association with NRDC and the Technology Utilization Division.

The training programme, which extended up to 28 December 1974, consisted of fifteen lectures.

Research and Industry Get-together : RRL, Jammu

The Regional Research Laboratory (RRL), Jammu, organized a Research and Industry Get-together from 21 to 23 October 1974 at Srinagar. A number of national laboratories, government organizations, graduate entrepreneurs and private industrialists participated in the get-together. The background for the get-together was provided by the report of a survey, conducted by the laboratory, of the industries in the Jammu, Kathua, Udhampur, Srinagar, Anantnag and Baramulla districts of the state. Problems faced by various industries in Jammu and Kashmir (brought to light by the industrial survey, dialogues with the industries, Chamber of Commerce, government institutions, entrepreneurs, etc. and a questionnaire, supplied by RRL, Jammu and other CSIR laboratories) were discussed at the get-together. Inaugurating the get-together, Shri G. L. Dogra, Minister of Finance and Industries, Jammu and Kashmir Government, expressed satisfaction that the meeting was being organized at a time when the world was facing acute financial problems and when the industrial growth of the developing countries had been hampered for want of resources and new technology. He emphasized that only accelerated production could help overcome the present economic crisis.

In his welcome address, Dr C. K. Atal of RRL, Jammu, explained the basic policy of the laboratory and the various means through which it was helping industries to meet their R & D needs, diversification and modernization. He said that no industry could develop its own know-how with its own resources and that this was particularly true of the region where highly sophisticated and large-scale industries were non-existent. He hoped that the get-together would generate a three-way interaction among : (i) private and small cottage-scale industries; (ii) government departments concerned with industrial development; and (iii) the Council of Scientific and Industrial Research which is a storehouse of know-how covering numerous fields of industrial endeavour.

Addressing the meeting, Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, observed that the industrial progress and utilization of the natural resources of the state had been very slow. He offered every assistance from CSIR and its laboratories for the development of the industries.

Dr Mir Habibullah, Member, Executive Committee, RRL, Jammu, and Managing Director, Industrial Development Corporation of Jammu & Kashmir, was hopeful that the interaction and dialogue between the scientists and technologists on the one hand and its industrialists and the entrepreneurs on the other would be very fruitful.

The technical session, presided over by Shri Dogra and Dr G. S. Sidhu, Director, RRL, Hyderabad, was devoted to a review of the R & D needs and demands of industrial units. The speakers included representatives of the state government and private industries.

Group-wise discussions held at the get-together related to the following fields : agriculture and horticulture, engineering, pharmaceuticals, forest-based industries, food industry, minerals-based industries, leather, fur, papier mache and other handicrafts. The participants evinced keen interest in the fur-combing and trimming machine being developed by the laboratory; Namda machine being developed by the laboratory and MERADO (Ludhiana); and belt pump and 3-speed hub machine developed by MERADO (Ludhiana). Discussions were also held on growing of cash crops like hops, vegetable seeds and ornamental plants for which markets in the neighbouring countries could be developed. The discussions also revealed that the laboratory's work on the evolution of edible mushrooms was of particular interest to mushroom growers in the state. The discussions brought to light several areas in which the know-how developed by CSIR laboratories had satisfactorily met or would meet the needs of the industrial units, for example (i) know-how for low-cost sheds for industrial entrepreneurs, from CBRI and CMERI; (ii) know-how for puzzolana and lime-puzzolana mixture, from CBRI and CRRI; (iii) know-how for extraction of santonin from low-yielding *Artemesia*, from RRL, Jammu; (iv) know-how for utilization of wood core and veneer waste for making fibre boards, from RRL, Jammu; and (v) utilization of pure wood stumps and saw dust for production of active carbon and pine tar, from RRL, Hyderabad.

On the suggestion of Prof. Nayudamma, a follow-up committee to monitor the progress was constituted. The valedictory session was presided over by Shri S. Banerjee, Chief Secretary, Jammu & Kashmir Government, in which the conveners of various groups presented their reports and the observations of various participants.

Steel & Mines Minister's Visit to NML

Shri Chandrajit Yadav, Union Minister for Steel and Mines, who visited the National Metallurgical Laboratory (NML), Jamshedpur, on 18 January 1975, appreciated NML's efforts to help the country attain self-reliance in ferrous and non-ferrous metallurgical techniques. Prof. V. A. Altekar, Director, while conducting the Minister round the laboratories, apprised him of the main achievements of NML, viz. production of sponge iron; development of aluminium conductors as a substitute for copper for various end applications; low-alloy high-strength structural steel; nickel-free heating elements; non-ferrous metal powders; production of welding fluxes; standard reference samples for chemical analysis; dense carbon aggregate and soderberg paste for ferro-alloy manufacture and aluminium furnaces.

Shri Yadav was particularly happy to note that NML had recently commissioned a 100 tonnes/day sponge iron plant using a modified rotary kiln. He expressed the hope that the results of the commercial trials being undertaken at this unit would lead to nation's increased steel production, particularly in the non-coking coal areas. Another project in which the Minister showed keen interest was the production of steel from basic pig iron using side-blown converter technique. He was hopeful that the process know-how released by NML to a few entrepreneurs would spread to other industrial units.

The collaborative efforts of NML and the Hindustan Steel Ltd and industrial-scale in-plant trials at the Rourkela Steel Plant of HSL for the development of a new high-strength low-alloy structure steel had been highly encouraging. This steel will lead to savings in the quantity of steel required for use in construction of bridges, ships, transmission towers, pressure vessels, etc.

The NML process on electric-grade aluminium conductor alloy (NML-PM2) has already been translated into industrial commercial production. The Minister appreciated that this alloy had been satisfactorily explored for a large number of applications on commercial scale by electricity boards, Railways, and electrical industry. He greatly appreciated the replacement potential of this alloy to reduce import of copper.

The Minister complimented NML on its efforts to start a dialogue with steel plants and other metallurgical units all over the country for identifying problems for research and development work at NML.

Start-up of Hydrodesulphurization and Catalytic Reforming Units of Haldia Refinery

A team of four engineers from the Indian Institute of Petroleum (IIP), Dehra Dun, and two from the Institut Francais du Petrole (IFP) participated in, and successfully carried out, start-up of pretreating and catalytic reforming, and hydrodesulphurization units of the Haldia Refinery of the Indian Oil Corporation Ltd (IOCL) during November-December 1974. The results of test runs conducted have met all guarantees stipulated in the contract and have been accepted by the Haldia Refinery.

Processes for pretreatment and catalytic reforming of naphtha, and hydrodesulphurization of kerosene were jointly licensed by IIP and IFP to IOCL (Haldia Refinery). The pretreatment unit is employed to refine the naphtha to reduce the level of impurities like sulphur and trace metals so that it is suitable for the next processing step of catalytic reforming. Catalytic reforming is employed to improve the octane number of pretreated naphtha. The object of using hydrodesulphurization process for kerosene/aviation turbine fuel is to improve the colour, stability, silver corrosion and other properties of the petroleum fractions.

The participation of IIP engineers in the start-up of these units is estimated to have saved foreign exchange equivalent to about Rs 2·00 lakh.

Investigations on Dielectric Correlation between Powder and Bulk

Studies on correlating the dielectric behaviour of a material in powder form and in bulk have been made by Shri A. S. Yadav under the guidance of Dr Ram Parshad at the National Physical Laboratory (NPL), New Delhi. Using concepts of light scattering and Huyghen's light diffraction a new formula for dielectric correlation has been developed. The formula gives a good correlation for permittivity values up to about fifteen. A graphical method was also developed for utilizing Bottcher's equation up to high values of permittivities. Normally, Bottcher's formula fails for permittivity values beyond ten. By the graphical method, correlation could be made for permittivity values of up to hundred or more. To overcome the difficulty, in the graphical method, of requiring permittivity data for a number of packing fractions of the powder, a new approach, based on microscopic permittivity around a central particle of the powder, was developed to modify the Bottcher's formula so that one single experimental observation would be sufficient for obtaining dielectric correlation for even high permittivity values approaching hundred.

Litcheneker and Rother's logarithmic formula was modified to yield precise values of permittivities. Also, a graphical procedure was developed to obtain the exact correlation using the logarithmic method. For obtaining precise experimental observations for dielectrics having high permittivities, new experimental methods were developed at microwave frequencies. Using this procedure, experimental data were obtained for a number of chemicals of different homologous series. Rules between permittivity variation and molecular structure were formulated and an explanation was given for them in terms of fundamental considerations.

The dielectric correlation can be used for finding the permittivity of bulk using the powder permittivity without making single crystals big enough to fit capacitor plates or waveguides. The correlation is also useful in designing artificial dielectrics of predetermined permittivity values made of a heterogeneous mixture for use in modern electronic technology.

Shri Yadav was awarded the Ph.D. degree of the Meerut University for his thesis based on the studies.

BITM's Mobile Science Exhibition

Notable among the various extension activities of the Birla Industrial & Technological Museum (BITM), Calcutta, is the mobile science exhibition which started functioning in 1965. For the first time, an elaborate programme has been drawn up to cover some of the eastern states like Assam and Nagaland by one of the mobile units of the museum on the theme 'Transformation of Energy'. Some 28 exhibits of the unit give the basic idea about the use of natural sources of energy like sun, wind and water, and man-made sources of energy like electricity, heat, light, magnetism and steam. The exhibits are arranged on a 'Museobus' which serves as the exhibition hall and moves from place to place.

The first venue of the exhibition in Assam was Gauhati. The exhibition organized by BITM in collaboration with the Director of Public Instructions, Assam, was inaugurated at the District Library premises, Gauhati, on 22 December 1974. Speaking on the occasion, the Chief Minister of Assam, Shri Sarat Chandra Sinha, stressed the need for imparting science education to children. The Chief Minister said that facilities for science education in the schools of the state were almost non-existent and added that such an exhibition would greatly help the students to derive scientific knowledge. Shri Sinha hoped that a science museum would soon be established in the state.

The State Education Minister, Shri Harendra Nath Talukdar, who presided over the inaugural function, underlined the need for science education for the economic development of the state.

Shri A. Bose, Director of Museums, CSIR, traced briefly the history of this first science museum in India and also explained its educational activities.

Conference Briefs

Dr S. H. Zaidi, Director, Industrial Toxicology Research Centre, Lucknow, attended, on invitation, a meeting of WHO Study Group on 'Early detection of health impairment in occupational exposure to health hazards' held in Geneva from 10 to 16 December 1974. The objective of the study group was to review, evaluate and recommend methods for the early detection of health impairment in occupational exposure to different hazardous conditions to be used in the practice of preventive occupational medicine; to prepare a list of priorities of exposure-health effects for WHO's future work; and to identify areas where there are gaps in knowledge for further research.

The panel of experts for the scientific group included, besides Dr Zaidi, eminent specialists and scientists from USA, France, Rumania, Czechoslovakia, Switzerland, Denmark, The Netherlands, Poland, Italy, Finland and Sudan. Dr Zaidi presented two papers dealing with fibrogenic dust and noise hazards.

Dr Zaidi was chairman of the sub-committee on metal hazards and early detection of metal toxicity in occupational exposure. The sub-committee evaluated the current trends of research in metal toxicity, recommended areas of strategic importance and made recommendations for evolving preventive and diagnostic measures.

Progress Reports

CMRS Annual Report : 1973-74

The Central Mining Research Station (CMRS), Dhanbad, continued to make concerted efforts towards the solution of the immediate problems of the mining industry and of the manufacturers of mining machinery and equipment for fabricating safe and standard materials. The annual report of CMRS for 1973-74 published recently shows that during the year, the laboratory investigated 128 projects of which 75 were sponsored by the industry. Work on 69 projects was completed, and 59 projects were in progress. The total financial inputs for the period covered under the report amounted to about Rs 47·40 lakh and the revenues from sponsored projects, consultancy services, testing and sale of publications were about Rs 8·13 lakh.

The laboratory carried out roof bolt investigations at Balaghat coalmine where the haulage levels and the winzes posed bad roof conditions. As the winzes were developed through a weak ore body, roof support by conventional steel rails with wooden laggings would have been very expensive and difficult. Hence, bolting and roof stitching were experimented upon and found to be quite cheaper. Experimentation on roof stitching was done at six other mines and it was introduced as a systematic roof support at the mines.

The laboratory made investigations on strata control in longwall workings at Surakachar coalmine and observed that better control of strata could be achieved with hydraulic sand stowing by having the faces in dip-rise direction because in this case stowing of goaf was better and resulted in lesser strata movement at the faces.

Investigations relating to the stability of pillars were made by CMRS in five mines. Ventilation surveys were carried out in five mines, and the work on planning the ventilation system in three mines was completed. Dust problems of Noamundi iron ore pelletizing plant, pyrite crushing unit of Sindri sulphuric acid plant and new calcining plant of TISCO were investigated and reports were provided to the respective parties. Other major areas in which CMRS carried out investigations are guniting, surface subsidence, model study, pneumatic and hydraulic stowing, blasting, methane emission, fire, explosion, explosive compositions, physiological strain of miners, energy expenditure of miners, spontaneous heating of coal, pneumoconiosis, degassification and bacterial mining.

The laboratory designed and developed a 20-tonne hydraulic pit prop from indigenous materials. The prop had a robust mechanical load indicating system which also acted as the safety release valve. The capacity of the prop can be changed whenever desired. The laboratory also made modifications to the 20-tonne hydraulic pit prop after which the prop passed all the necessary tests.

A portable and intrinsically safe methanometer for use in mines was developed. The instrument is based on combustion principle with a wheatstone bridge measuring circuit and can estimate methane in 0-5% range. The know-how was released to the sponsor.

Circuit testers available in the market have disadvantages, viz. (i) current passing through the fuse head is of the order of 10 mA which could be reduced to 1 mA, and (ii) the scale is not linear. A circuit tester which has none of the drawbacks mentioned above has been designed and developed. The know-how has been released to the sponsor.

The laboratory designed and developed a simple portable triaxial apparatus for rock testing in collaboration with the Indian School of Mines, Dhanbad. The apparatus, designed to test specimens from 50 to 140 mm in diameter, is cheaper and easier in operation than the conventional triaxial testing apparatus. The set-up permits the application of axial load manually up to 100 tonnes and a maximum confining pressure of 400 kg/cm^2 which, however, can be raised to 600 kg/cm^2 with the help of an external pump or long levers which may be provided with the screw pump. A linear scale is provided with the screw pump to measure accurately the volume of the oil which is displaced into the pressure chambers.

Work was also taken up on the design and development of a plastic sleeve for guniting, multishot exploder circuit, gas detectors, self-rescuer, resistance thermometer, humidity detector tube, anemometer, hydropneumatic prop and cable fault locator.

A patent relating to gravimetric dust sampler for respirable dust was filed. Processes on carbon monoxide detector tube and electrical relay tester were released to the industry for commercial exploitation.

CSIR Support To Research

New Schemes

Metabolism of Diethylcarbamazine

Filariasis is a disease of great public health importance. In India, about 12 million people harbour microfilariae in their blood and over eight million people are estimated to be acutely suffering from the disease. The chief drug for the treatment and control of *W. bancrofti* filariasis continues to be diethylcarbamazine. The drug appears to be effective against microfilariae *in vivo* and its incorporation in cooking salt and use in mass therapy was suggested to reduce the microfilarial reservoir in the population. A detailed study of the metabolism of diethylcarbamazine will help understand the fate and mechanism of action of the drug as well as the mechanisms of its detoxification.

Under a new CSIR research scheme sanctioned to Dr B. C. Harinath, Associate Professor and Head, Department of Biochemistry, Mahatma Gandhi Institute of Medical Sciences, Sevagram, attempts will be made to develop a specific and sensitive colorimetric method for assaying diethylcarbamazine. Separation and quantification of the drug metabolites will be effected by paper and thin layer chromatography and other biochemical techniques. Further studies proposed are : (i) identification of drug metabolites in human blood and urine samples after the administration of the drug and study of related drug metabolizing enzymes; and (ii) effect of drug metabolites on microfilariae and infective larvae of *W. bancrofti in vitro.*

Linear Induction Motors and Devices

Linear induction motors and devices are a new field of technology with a variety of applications. Many small gadgets have appeared commercially abroad. However, the major application, namely high-speed ground transportation using linear motors, is still at a developmental stage. Under a new CSIR research scheme granted to Dr R. Arockiasamy of the Department of Electrical Engineering, Indian Institute of Technology, Delhi, it is proposed to initiate preliminary studies on the design of low- and high-speed linear induction motors. The following types of geometries will be considered : (i) short stator, (ii) short rotor, (iii) tubular, (iv) transverse flux machine, and (v) open-ended stator. Extensive theoretical work will be carried out to find the characteristics of each type of linear induction motor, and its suitability for particular applications in industry will be assessed. Particular attention will be paid to linear induction motors suitable for high-speed (300 to 500 km/hr) transportation.

Ecology and Productivity of Lakes and Impoundments Around Jodhpur

There are a number of small- to medium-sized lakes and water reservoirs in the state of Rajasthan which could be good sources of fish yield. However, no limnological study with regard to productivity has been carried out on any of the lakes in Rajasthan. The exploitation of the aquatic productivity for food would naturally entail extensive research and development efforts for some years to come. Considering the background of the estimated inputs of the order of Rs 300 crore for water resources by the Rajasthan Government in the Fifth Plan period and prospects of completion of the Rajasthan Canal, one can visualize the great possibilities of fish production, for which even small impoundments would be very valuable. In a new CSIR research scheme granted to Prof. S. D. Misra (principal investigator) and Dr S. C. Bhargava (co-principal investigator) of the Department of Zoology, Jodhpur University, Jodhpur, it is proposed to exploit the freshwater resources of Rajasthan for better fish yield.

Seasonal variations in abiotic factors—meteorological and hydrological (including the nutrients)—and biotic factors (zoo- and phytoplanktons) will be studied in the various freshwaters. Productivity of these waters will be measured through quantitative estimations of chlorophyll, oxygen evolution as well as of the nutrients.

Studies on Carbohydrate Nature of Urinary Acid Hydrolases

The deficiency of acid hydrolases has been observed in the organs of the patients suffering from metabolic diseases of inherited origin. These acid hydrolases are lysosomal enzymes and have shown by different workers to be glycoprotein in nature. B-N-Acetyl hexosaminidase, which exists mainly in two isoenzymic forms A and B, has been purified from various sources. Isoenzyme A has been shown to be absent in brain, liver and kidney in Tay-Sach's disease. The total deficiency of both the isoenzymes was shown in Sandhoff's disorder. B-Galactosidase is absent in brain and other organs of the patients suffering from GM$_1$ gangliosidosis. This enzyme has been detected in normal urine but found to be absent in the urine in the case of GM$_1$ gangliosidosis. Very little is known about the chemistry of these various acid hydrolases. The aim of a new CSIR research scheme sanctioned to Prof. Debkumar Basu of the Department of Neurological Sciences, Christian Medical College & Hospital, Vellore, is to study the physico-chemical and immunological properties as well as the nature of the carbohydrates present in two urinary enzymes, namely B-galactosidase and B-hexosaminidase. This study will not only help in establishing the tissue specificity but also in answering the question whether the urinary enzymes are excreted intact or are degraded tissue enzymes. The physico-chemical and immunological properties of the urinary acid hydrolases may then be exploited for the use of these enzymes as replacement therapy.

Compounding of Synthetic Rubber with Lignins

The production of SBR is not sufficient to meet India's demand. The country imports other synthetic rubbers, namely butyl, nitrile and neoprene. Recent shortage of petrochemicals has made the problem more acute. In a new CSIR scheme granted to Dr Sadhan K. De, Assistant Professor in Chemistry, Indian Institute of Technology, Kharagpur, it is proposed to carry out investigations on the compounding of synthetic rubbers with lignin.

Lignin, built up mainly if not entirely of phenylpropane units, is obtained as a byproduct from paper and pulp industries. Its structure varies from source to source depending on the nature of the plant. Preliminary studies carried out in this laboratory indicate that lignins are compatible with natural rubber. The reduced density and good physico-mechanical properties imparted to the vulcanizates as well as the low cost are all in favour of large-scale use of lignins in rubber industries. The research project is aimed at exploring these possibilities, particularly with synthetic rubbers.

Completed Schemes

Determination and Separation of Noble Metals

Although thiourea and its alkyl or aryl derivatives give sensitive colour reactions with the platinum metals, the reagents, however, lack in selectivity. The introduction of an acyl group in one of the nitrogen atoms of the thiourea molecule yields a better reagent for platinum metals. The availability of an extra oxygen atom of the acyl group as donor in addition to the nitrogen and sulphur atoms of the thiourea molecule increases the potentiality of the reagent towards complexation under different conditions of acidity. Further, the replacement of hydrogen in another nitrogen atom of the acyl substituted thiourea by a phenyl or pyridyl group is likely to further improve its complex-forming property. Hence a series of substituted thioureas of the type RNH·C:S·NH·C:O·R′ (where R is phenyl, pyridyl, 2-nitrophenyl, 4-nitrophenyl or 5-bromopyridyl group and R′CO is benzoyl, acetyl, 3-nitrobenzoyl or 4-nitrobenzoyl group) have been prepared. The studies were made in a CSIR research scheme investigated under the direction of Prof. S.C. Shome at the Department of Chemistry, Presidency College, Calcutta. The research scholars who carried out the studies were Sarvashri Dilip Kr. Das and Prodyot Kr. Haldar. Preliminary investigations indicate that N-phenyl-N′-benzoyl thiourea, N-(2-nitrophenyl)-N′-benzoyl thiourea, N-(2-nitrophenyl)-N′-acetyl thiourea, N-(4-nitrophenyl)-N′-benzoyl thiourea, N-(4-nitrophenyl)-N′-acetyl thiourea, N-α-pyridyl-N′-(3-nitrobenzoyl) thiourea, N-α-pyridyl-N′-(4-nitrobenzoyl) thiourea are not suitable for either gravimetric or spectrophotometric determination of the noble metals. The reagents are deeply coloured, insoluble in water, sparingly soluble in ethanol and are not useful for the determination of the platinum metals. The use of the reagent N-α-pyridyl-N′-acetyl thiourea for the gravimetric or spectrophotometric determination of noble metals is disadvantageous because of the hydrated nature of the precipitate formed by the reagent with platinum metals, solubility of the metal chelates in water and non-extractability of the chelates in organic solvents.

N-Phenyl-N′-acetyl thiourea (PAT) cannot be employed either for the gravimetric determination of the platinum metals or for the spectrophotometric determination of Pd, Pt, Rd or Ir. PAT can however be used for the spectrophotometric determination of Ru(III) or Os(VI) in the presence of other platinum metals and base metals. N-α-Pyridyl-N′-benzoyl thiourea (PyBT) has shown interesting analytical properties and has been employed for both gravimetric and spectrophotometric determinations of all the platinum metals. The interfering ions for the gravimetric determination are : Rh(III) for Ir(III) and vice versa, Pt(IV) for Pd(II) and vice versa, Rh(III) and Ir(III) for Os(VI). PyBT provides a simple and accurate method for the gravimetric determination of iridium(III). The reagent produces sensitive and selective colour reactions with ruthenium(III), osmium(VI), palladium(II), and platinum(IV) and is suitable for the spectrophotometric determination of each of these metal ions in the presence of all the base metals and other noble metals. Rhodium(III) and iridium(III) can be determined spectrophotometrically by the use of PyBT in the presence of all other foreign ions, but in the absence of each other. N-α-(5-Bromopyridyl)-N′-benzoyl thiourea (Br-PyBT) is insoluble in water and cannot be used for the gravimetric purpose. Br-PyBT, however, produces highly sensitive colour reactions with ruthenium(III), rhodium(III), palladium(II), osmium(VI) and iridium(III), and has been employed for the spectrophotometric determination of ruthenium(III), palladium(II) and osmium(VI) in the presence of all other platinum metals and base metals. In the determination of rhodium(III) and iridium(III), however, they mutually interfere.

One of the research scholars, Shri Dilip Kr. Das, was awarded Ph.D. degree by the Calcutta University for his thesis based on the studies. The other research scholar, Shri Prodyot Kr. Haldar, has submitted his thesis.

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Silver Jubilee Celebration : NCL

The National Chemical Laboratory (NCL), Poona, celebrated its silver jubilee on 1 February 1975. The celebrations were inaugurated by the Prime Minister, and President, CSIR, Shrimati Indira Gandhi. In her inaugural speech, the Prime Minister urged upon the scientists to examine in depth the long-term effects of the present direction of science and technology on people and the environment. She congratulated the laboratory on its having undertaken the technological development of Chandrapur, a backward district of Maharashtra. "This was a challenge worthy of fine scientific intellects and we shall all watch your work with interest", the Prime Minister said.

With the diversification of industry and the increasing efforts to harness the various resources the responsibilities of our scientific and industrial research centres had become more onerous and complex. The Prime Minister was aware of the problems faced by the laboratory in the transfer of technology to industry. She said that entrepreneurs and officials were afraid of taking risks and still considered foreign equipment, processes, experts and, not the least, foreign brand names as glamorous. Similarly, there was lack of recognition of the research of our laboratories—especially in certain aspects of construction engineering. "I am trying to change this outlook", she added.

The Prime Minister regretted that the country could not provide satisfying working conditions for the exceptionally gifted scientists and the impressive number of highly competent scholars that were produced in the country. Other countries were taking advantage of those scientists who were trained in our country at such expense. She considered this a passing phase, for she did believe that in the not distant future we would be able to absorb almost all of our creative talent.

The President of CSIR further added that the major centres of scientific research like NCL should maintain a creative balance between intellectual discovery and applied developmental work. She was glad that the aim of NCL was "to effect breakthroughs in technology based on sound fundamental research and a high order of scientific capability for innovation".

The Prime Minister complimented the laboratory for generating confidence in industry and for the range of work which was being taken up by the laboratory. In a reference to Dr Tilak's statement that if the processes developed in the laboratory were fully taken up then NCL would contribute Rs 200 crore to the national economy, she said that the figures were indicative of the growing cooperation between NCL and the chemical industry. But she would not judge the quality of work of a scientific centre only in a narrow actuarial term. It was important to manufacture new products, and more important was to manufacture equipment and process which make

LABORATORY

Prime Minister Shrimati Indira Gandhi inaugurating the silver jubilee celebrations of NCL, Poona. Seated on the dias are (from left) Dr L. K. Doraiswamy and Dr B. D. Tilak, the Director.

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the products. "And above all, we should shape the creative minds which create these processes—that is true self-reliance. Our higher scientific research centres should aim at developing individuals with such creative urges and capabilities. This quality cannot be measured always in economic terms", she said.

The Prime Minister stressed the need for investigations to evolve new fertilizer combinations so as to enable farmers to grow more at a lower caloric input into the soil. Since much intensive agriculture was dependent on the administration of nitrogenous fertilizers there was need for more attention to the study of nitrogen fixation.

In his welcome address, Dr B. D. Tilak, Director, NCL, said that as a discipline-oriented laboratory NCL was well equipped for undertaking basic and applied research in chemistry and chemical technology in several broad areas. While reviewing the work of the laboratory, the Director said that the laboratory had developed an excellent rapport with small, medium and the organized sectors of the chemical industry.

Dr Tilak said that the long-range projects of significance to the country's socio-economic needs would receive greater attention. Efforts would be devoted to R & D problems relating to health and food production such as development of technology for drugs, pesticides, plant growth promotors, and the use of plant tissue culture as an innovative approach to improve agricultural production. Utilization of hitherto untapped mineral and organic (plant products) natural resources and development of technology for bulk organic chemicals and polymers were the areas which would be vigorously investigated since high returns on R & D investments were expected in such areas.

Dr B. D. Tilak (back to camera), Director, NCL, apprising the Prime Minister of the work of the laboratory. Also seen are: Prof. Y. Nayudamma and Dr L. K. Doraiswamy (extreme right)

The Director stressed the need for a technological policy resolution to supplement the Science Policy Resolution.

On this occasion the laboratory brought out a souvenir, and a brochure entitled 'Achievements in Technology Transfer' which gives details of major processes and products being commercially produced on the basis of NCL know-how. These products relate to diverse areas such as bulk organic chemicals and petrochemicals, pesticides, insecticides and fumigants, dye intermediates, polymers and elastomers, electronics and instruments, perfumeries, and a variety of industrial chemicals.

The value of production based on the know-how developed by NCL on its own for the year 1973-74 was around Rs 39 million. The laboratory has also been encouraging industry to participate in its efforts by sponsoring research on developmental projects in order to ensure quick utilization of research results. The value of production resulting from the commercialization of such sponsored projects during 1973-74 was Rs 26 million. The cumulative value of production based on NCL know-how up to 1973-74 was about Rs 226 million and since most of the production led to import substitution the foreign exchange saved was estimated at Rs 90 million.

The function was presided over by Shri V. P. Naik, then Chief Minister of Maharashtra.

Comfortable Buildings through CBRI Techniques : Exhibition at CBRI

An exhibition on Application of Physics to Building Designs was arranged by the Central Building Research Institute (CBRI), Roorkee, on 10 February 1975. The exhibition was intended to familiarize engineers, architects and others with the recent work done at the institute on lighting of buildings, heat transfer, acoustics, building climatology, building ventilation and utilization of solar energy. In his welcome address, Prof. Dinesh

Mohan, Director, CBRI, stressed the role of such exhibitions in creating awareness among the laymen. While inaugurating the exhibition, Dr A. R. Verma, Director, National Physical Laboratory (NPL), New Delhi, quoted several instances to illustrate that the equipment and standards based on conditions obtaining in other countries were not suited to Indian climatic conditions. Dr Verma appreciated the role played by CBRI in providing norms for the design of thermally efficient houses which were comfortable to live in and were most suited to Indian climatic conditions. He pleaded for a greater measure of collaboration among the scientists of CBRI and NPL for solving the problems of heat, light and acoustics in the context of building designs.

Dr V. Narasimhan of CBRI briefly reviewed the interaction between man, physics and building, and highlighted the role of physics in the design of buildings. He said that CBRI had devised experiments to determine the thermal properties of building elements and fabrics whereby an attempt had been made to grade materials according to their thermal performance at different temperature levels and evolve an index of human comfort applicable to tropics. He pointed out that the institute had brought out publications based on its work on Indian climate with the result that Indian designers need not refer to other publications for the information that they require while formulating their own designs. Dr Narasimhan added that the work of the physicists in CBRI had led to the formulation of eleven building codes dealing with measures and methods by which buildings could be made more comfortable for men to live and work. He stated that the institute had not only solved the problem of tropical daylighting in all its aspects, but also extended the concept to other neighbouring countries from Sri Lanka to Taiwan. He mentioned that CBRI was also aware of the energy crisis right from 1960 and had been developing suitable solar water heaters for domestic as well as industrial use.

Some of the important exhibits related to the application of solar energy in making water heaters, acoustics in the design of auditoria and heat transfer in cold storage.

R & D Efforts Towards Progress of Chemical Industry

The technology requirements of the chemical industry in the foreseeable future in India were discussed at a special meeting of the coordination council of the chemical sciences group of national laboratories held on 2 January 1975 along with the officials of the Directorate General of Technical Development (DGTD), Ministry of Petroleum & Chemicals, the National Research Development Corporation of India, and the Department of Science & Technology. The objective of the meeting, arranged at the instance of DGTD, was to identify gaps in technology, available or under development, which should be met either through further efforts or import of technology. There was also a gap between the development of technology, its utilization and transfer which appeared mainly in terms of the scaling up of engineering capability. In some areas, the need has been felt for carrying out R & D work to avoid repetitive imports of technology.

In the general discussion which preceded discussion of specific programmes, it was stressed that augmenting of design engineering and upscaling capability would help cover the credibility gap between research institutions and industrial firms and would lead to greater utilization of indigenous technology. The need for policy decisions by the government for incentives and provision of risk capital for utilization of indigenous technology was stressed.

Among the technology requirements identified were : maximum efficiency in utilization of energy by way of process and equipment modifications; recovery of chemicals from coal-tar; and processes for finished products as well as intermediates for the pesticide industry. Recommendations were made for forming area-wise groups of members of the departments concerned to look into the detailed development, time schedule and financing problems. Among the areas covered were : pesticides, polymers, drugs and pharmaceuticals, organic and inorganic chemicals, and rubber chemicals. The Directorate General of Technical Development drew attention to the need for sophisticated technologies for large projects like catalytic oxidation of olefins, terephthalic acid and vinyl acetate. Some areas, for instance chlorinated paraffin wax, which had been worked out by private industries were identified for deletion in order to avoid duplication in effort. Items like pentaerythritol, menthol, expandable polystyrene beads, carbon black, cellulose acetate and polychlorinated biphenyl were recommended for further development. Some chemicals with no future potential were recommended for being deleted from the programmes, e.g. 2, 4-dinitrochlorobenzene and 2, 4-dinitrophenol, and cyclohexane for which the raw material availability may not be assumed.

The list for 1974-75 earlier circulated by the Ministry of Industrial Development, indicating possible areas for foreign collaboration, was discussed with a view to making necessary amendments. Indigenous developments in respect of some items were noted. It was decided that the suggestions should be finalized within a month after receiving the comments from the national laboratories.

Information Management in Community Water Supply and Waste Disposal : Workshop at NEERI

A two-day workshop on 'Information Management in Community Water Supply and Waste Disposal' was held at the National Environmental Engineering Research Institute (NEERI), Nagpur, during 11-12 December 1974, under the joint auspices of the World Health Organization and NEERI. About 50 participants attended the workshop. Four of them were overseas delegates and the others were from India representing public health engineering departments of state governments, practising engineers, university professors, planners, administrators, information specialists and industrialists. Ten papers compiled in the form of an advance document by NEERI presented the multifaceted approach for effective management of information and described the various techniques being practised.

The efforts made by WHO in bringing out 'Guide on information systems for planning and evaluation of community water supply and community waste water disposal programmes' were appreciated by the participants. Shri D. V. Subrahmanyam, who represented WHO, complimented NEERI for taking a lead in organizing the workshop.

Discussions pointed to the conclusion that the guide should contain minimum essential information and additional desirable information separately, means for improving an existing information system, data collection techniques, detailed case examples, and a built-in mechanism for checking the veracity of the information collected. The need for simplifying the system was also emphasized. It was also recommended that the guide should be tested, besides at training centres in different countries, on a pilot scale in a few countries to assess its practicability.

The deliberations of the workshop focussed attention on the following areas : (i) Information systems for planning and evaluation of community water supply and community waste water disposal programmes—Draft Guide by WHO; (ii) Problems of storage, retrieval, dissemination and communication of information; (iii) Characteristics, testing and evaluation of information; and (iv) Education and training of information personnel.

Some of the important recommendations arrived at as a result of the exchange of ideas between the generators, processors and users of information are :

(1) There is a great need for more effective information transfer and broader dissemination of information to potential users and for better information management system in the country.

(2) There is need for a National Documentation Centre in India for community water supply and waste water disposal.

(3) A case study should be organized by NEERI as a pilot project to assess the information needs of users, if possible, with national and international organizations.

(4) Training of personnel for information management should be undertaken at the earliest.

(5) The activities of NEERI as WHO Regional Reference Centre, and the International Reference Centre Network of WHO for Community Water Supply, Waste Disposal and Air Pollution were appreciated. The facilities at NEERI should be strengthened.

The workshop was inaugurated by Dr Rafiq Zakaria, Minister for Urban Development, Government of Maharashtra, and presided over by Dr P. S. Mene, Vice-Chancellor, Nagpur University.

Mineral Based Industries in Eastern Region : Symposium at RRL, Bhubaneswar

A symposium on Mineral Based Industries in the Eastern Region was organized by the Regional Research Laboratory (RRL), Bhubaneswar, on 21 December 1974. The symposium was inaugurated by Smt. Nandini Satpathy, Chief Minister of Orissa.

In her inaugural address, Smt. Satpathy called for rationalized thinking on the utilization of ores and minerals and development of mineral based industries in the eastern region. Referring to the large-scale minerals export programmes, she observed "it is not a resources development programme and is, in fact, a programme of trading long-term advantages for short-term gains". Stating that the agricultural sector was overpopulated, she stressed the need for shifting the labour force from agriculture to industry. In this context, she suggested two specific and interdependent approaches to the problem. The first one is a vigorous R & D programme aimed at not only discovering new uses of minerals but developing low-cost techniques of utilization. The second approach is to maximize investment on development of mineral based industries.

Shri M. A. Wadud Khan, Chairman, Steel Authority of India Ltd (SAIL), who addressed the gathering, expressed the hope that the large number of specialists attending the symposium would pool their expertise in mapping out a strategy of development for the mineral based industries in the eastern region. Shri Khan broadly indicated the potentialities in various directions. Referring to the deposits of ores and minerals, power generation capacity and transport facilities in the region, he observed that a large investment had been made in basic and mining industries and further investments having linkages with basic industries would be necessary for contributing to the integrated regional development. The eastern region had received the largest share in public investment because of the rich resources in the region. Shri Khan said that even though Orissa possessed large mineral deposits, coupled with port facilities, the state was basically dependent on agriculture. He suggested that mineral industries should, therefore, be matched through investment in agriculture and agro-based industries so as to generate a balanced growth of industrial and agricultural sectors for the rapid development and prosperity of this state.

In his welcome address Prof. P. K. Jena, the Director, said that the vast mineral resources of the eastern region offered a tremendous scope for the development of mineral and metal based industries. The Director mentioned the role played by this laboratory in the development activities in the field of minerals and metals. He further stated that CSIR had plans to develop a non-ferrous metallurgical research centre in the laboratory to carry out the work on geological studies, beneficiation and agglomeration of ores and minerals, extraction of metals, studies on non-ferrous alloys and development of special materials. Prof. Jena also emphasized the need for interaction among policy makers, industrialists, technologists, scientists and educationists for setting up a large number of metallurgical and chemical industries in the region.

Twenty-seven papers were presented at the symposium in three sessions. Topics relating to geological surveys in the eastern region, mineral based industries, aluminium and aluminium based alloy industries, waste utilization, utilization of ore fines, preparation of pellet coke from coal, extraction of nickel and cobalt from lateritic nickel ores, resources of moulding sands and their suitability in foundry industry, prospects of clay based industries, etc. were discussed. While discussing the prospects for sponge iron plants in the region, Dr V. A. Altekar, Director, National Metallurgical Laboratory, Jamshedpur, referred to alternative methods of reducing the iron ore. These are : (i) use of a vertical shaft furnace, and (ii) gaseous reduction by a petroleum byproduct naphtha. Results obtained in these processes were highly satisfactory and the processes were being scaled up.

Problems concerning the supply of raw materials to existing industries and other administrative problems relating to the setting up small-scale industries came up for discussion. For speedy implementation of some of the programmes, discussed at the symposium, it was felt necessary to strengthen the existing infrastructure.

In the concluding session, Prof. Jena stated that the laboratory had developed know-how for chromite agglomeration, magnesite beneficiation, preparation of pure and high-purity graphite, preparation of synthetic rutile from ilmenite, removal of phosphorus from manganese ores, and production of refractory from fly ash. He called upon the industrialists present at the symposium to make use of the facilities available in the laboratory for sponsoring large-scale work on these processes.

Seminar on Solid Earth Geophysics

A two-day seminar on Solid Earth Geophysics was held at the National Geophysical Research Institute (NGRI), Hyderabad, on 27 and 28 December 1974. The seminar was jointly sponsored by the Indian National Committee for International Union of Geodesy and Geophysics (IUGG) and the International Geodynamics Project and was co-sponsored by eight scientific organizations including NGRI, Geological Survey of India, Oil and Natural Gas Commission (ONGC), Central Ground Water Board and Survey of India.

The object of the seminar was to review the national reports of progress in various branches of geophysical research in India during the triennial period 1971-74, and finalize them for presentation at the sixteenth IUGG meeting scheduled in August 1975 at Grenoble, France.

In his inaugural address, Shri M. B. Ramachandra Rao, former member of ONGC, expressed optimism that "man would develop further his ingenuity and solve problems relating to the threatened depletion of the world's natural resources". He spoke appreciatively of the contributions of the organizations like NGRI in evolving methods, new tools and informative maps.

Presiding over the inaugural session of the seminar, Dr Husain Zaheer, former Director General, Scientific & Industrial Research, stressed the role of geology and geophysics in the economy of the country. Dr C. Karunakaran, Director General, Geological Survey of India, proposed the constitution of a separate Ministry for Earth Sciences which could promote the study of the earth.

In his welcome address, Dr Hari Narain, Director, NGRI (as also Surveyor General of India and President of IUGG National Committee), reviewed the work done during the Upper Mantle Project (UMP) and the Geodynamics Project. He stated that such international programmes were responsible for the development of new concepts like continuation of surface discontinuities deep inside the earth and the possibility of migration of large blocks of lands over millions of years in the history of the Earth. The uniqueness of the Indian sub-continent lies in having the youngest and the highest mountains full of riches in the north, the oldest peninsular shield in the south and vast sedimentary stretches between, which may harbour rich deposits of minerals and petroleum, a long coastline, large continental shelf areas, etc., which constitute great natural opportunities as well as exciting problems for geophysical work in the country. He said that by taking into consideration these problems the programmes for geodynamic investigations in the country were being formulated.

Technical Sessions

In the first session, national reports were presented in various areas of research including the work done under the Geodynamics Project since 1971. The national reports on Volcanology and Chemistry of the Earth's Interior, Geomagnetism and Geoelectricity, Meteorology and Atmospheric Physics, Hydrology, Seismology and Physics of the Earth's Interior, Geodesy and Gravimetry, Physical Oceanography and Geodynamics were finalized for presentation to the sixteenth meeting of IUGG.

Presenting the national report on Volcanology and Chemistry of the Earth's Interior, Dr C. Karunakaran reviewed at length the recent volcanic activity in the Indian sub-continent, which was the most significant episode of flood eruption in the geological history of the globe.

Shri B. N. Bhargava, Director, Institute of Geomagnetism, presenting the national report on Geomagnetism and Geoelectricity, mentioned some notable R & D efforts in the field, such as development of instrumentation (proton vector magnetometer) at NGRI and the portable instruments for granulometric studies of rocks *in situ* (TIFR, Bombay). Special magnetic observations by NGRI in the seismically active region (including Bhadrachalam) had indicated that tectonic and deeper conductivity structures of Bhadrachalam region in Godavari rift valley had some similarity with those of Koyna region. Under the electrojet survey programme, intensive magnetic observations made by NGRI, the Indian Institute of Geomagnetism and Survey of India in 1971 had led to the precise location of the magnetic dip equator.

Dr P. Koteswaram, Director General of Observatories, India Meteorological Department (IMD), reviewed the work of different organizations in the discipline of Meteorology and Atmospheric Physics. The studies covered numerical weather prediction, satellite meteorology, climatology, development of meteorological instruments, and solar radiation.

Dr D. S. Deshmukh mentioned some achievements in the field of hydrology, viz. (i) constitution of a permanent Indian National Committee for the International Hydrological Programmes; and (ii) publication of a base map of India on 1:4·5 million scale by the Committee of Hydrological Studies which shows important rivers, their catchment areas, important lakes and glaciers, etc.

Regional hydrogeological surveys were undertaken in a systematic manner by the Central Ground Water Board with a view to understanding the behaviour of groundwater regimes in relation to the various geological and hydrological settings in major river basins. Drought-affected areas in Rajasthan, Madhya Pradesh, Maharashtra and Andhra Pradesh were given priority.

Under a bilateral agreement between FRG and India, a collaborative project on the development of groundwater resources had been taken up by NGRI, Hyderabad and B.F.B., Hannovar. The salient features of the project are the integrated approach for exploration and management of groundwater resources of a basin as a unit. The Lower Manner River Basin has been taken up as a pilot area (that also includes the Karimnagar district adopted by CSIR for development through application of science and technology) for exploration and management of groundwater.

Dr H. M. Choudhury presented a report on Seismology and Physics of the Earth's Interior. According to the report, engineering organizations in the country had shown increasing appreciation of the need for seismic studies on important project sites and made significant contributions to the growth of engineering seismology. An important addition to the geophysical activity in India during this period was the deep seismic sounding of the crust which was initiated in 1972 by NGRI with USSR collaboration.

The national report on Geodesy and Gravimetry in India was presented by Shri R. S. Chugh of the Survey of India.

The report on Physical Oceanography and Marine Geophysics, prepared by Dr V.V R Varadhachari [National Institute of Oceanography (NIO), Goa] reviewed the work done in physical oceanography and some aspects of marine geophysics and geochemistry. An important development mentioned in the report was that physical oceanographers of NIO participated in a programme under the Indo-USSR joint expedition for studying the Indian summer monsoon under the MONEX (monsoon experiment), a project of GARP (Global Atmospheric Research Programme).

Continuous magnetic and bathymetric data were recorded on board the naval hydrographic ship *INS Darshak* along the continental margins of the northern part of the Arabian Sea. The data have identified the anticlinal trends near the continental slope west of the Bombay coast, deposition of Indus river sediments in a channel coinciding with the unconformity between Jurassic and Deccan traps in the Indus cone area, the continuation of Laccadive-Maldive ridge through the central portion of the shelf in the Bombay High area and a significant NE-SW trending fault with a downthrow on the SES in the Murray Ridge area.

The Oil and Natural Gas Commission conducted marine seismic surveys in some parts of the area west and north-west off the coast of Bombay with a view to detailing some of the structural features identified in earlier surveys.

The national report on Geodynamics was prepared by Shri L. N. Kailasam, Chairman, Indian National Committee for Geodynamics. The Indian National Committee for the International Geodynamics Project formulated India's programme for the international project to be implemented during 1974-75.

A series of invited talks on scientific topics of current interest, such as geological surveys in India, airborne geophysical surveys and satellite photography, Himalayan studies, seismology, gravity, nuclear geophysics, geochemical studies, marine geophysics, geothermal studies, and earth tides were presented.

Summarizing the discussions Dr Hari Narain, Director, NGRI, stated that the Himalayas, the Arabian Sea and the Bay of Bengal are the areas that need to be thoroughly worked for collecting the basic knowledge and called for concerted efforts in the exploration of their natural resources. He said that NGRI, which had developed facilities for a wide range of geophysical researches extending from theoretical research to laboratory modelling, airborne and ground geophysical surveys, deep seismic sounding, instrumentation, data processing and interpretation, was devoting considerable attention to these areas. In this task, it is quite possible that NGRI would be working in collaboration with organizations like NIO and ONGC.

Optical and other Properties of Semiconducting Films

Thin film properties have been the subject of growing interest in recent years due to their marked differences from the bulk. A detailed study of the optical characteristics of vacuum-deposited films of various semiconducting materials was undertaken by Smt. Anjana Mitra (CSIR research fellow) under the guidance of Dr A. Goswami, at the National Chemical Laboratory (NCL), Poona. The basic optical characteristics of these films, i.e. transmittance, reflectance and absorbance, were measured and the data subsequently utilized for the evaluation of their optical constants. The dependence of these parameters on film thickness, wavelength, substrate temperature, etc. was also studied. It was found that the deposition conditions which influence the grain growth, crystal size, surface asperities, etc. of the films also affected the optical properties considerably and hence their parameters. Electron diffraction techniques were utilized to identify the nature of the films and to correlate their structural and optical characteristics.

The study concerned primarily films of various semiconducting materials prepared by vacuum-deposition methods. For the optical studies a spectrophotometer designed and fabricated in the laboratory by Goswami was employed. For films with low transmittance, the R_s and R_p method was mainly utilized for the evaluation of the optical constants, while for transparent and semi-transparent films these were evaluated from the normal reflectance and transmittance data. Investigations were also made on the limitation of R_s and R_p method in the case of highly reflecting but absorbing films.

Studies made on the chalcogenides of lead (PbSe and PbTe) and tin (SnS, SnSe and SnTe) and the oxides of bismuth revealed the manner in which the optical parameters differ in films as compared to those of the bulk materials. Both the film thickness and substrate temperature considerably modify the optical properties and tend to shift the dispersion peaks observed in n and k. Such a shift with film thickness has been found to be related to the changes in the carrier concentrations of the films.

Studies on the absorption process, particularly of some transparent and semitransparent films, led to the determination of the optical energy band gaps and the nature of transitions, i.e. direct or indirect, allowed or forbidden, etc. It also indicated that the absorption process in thin films was similar to that in bulk materials though the inherent defects in the films caused some minor modification in their magnitude.

Smt. Mitra was awarded the Ph.D. degree (1975) by the Poona University for her thesis based on these studies.

NCST Reconstituted

Prof. Y. Nayudamma, Director General, Council of Scientific & Industrial Research; Dr M. L. Dhar, former Director, Central Drug Research Institute; and three directors of CSIR laboratories, viz. Dr Hari Narain (National Geophysical Research Institute), Dr B. D. Tilak (National Chemical Laboratory) and Dr S. R. Valluri (National Aeronautical Laboratory) are among the members of the reconstituted National Committee on Science and Technology (NCST). The chairman of the new Committee is Shri P. N. Haksar, Deputy Chairman, Planning Commission.

The other members are : Dr C. Gopalan, Director General, Indian Council of Medical Research; Prof. M.G.K. Menon, Secretary, Department of Electronics; Shri N. B. Prasad, Chairman, Oil & Natural Gas Commission; Dr A. Ramachandran, Secretary, Department of Science and Technology; Dr H. N. Sethna, Chairman, Atomic Energy Commission; Brig. B. J. Shahaney, Secretary, Technical Development; Dr M. S. Swaminathan, Secretary, Department of Agricultural Research and Education; Dr P. C. Alexander, Development Commissioner, Small Scale Industries; Dr A. Bhattacharya, Jadavpur University; Dr A. B. Joshi, Director, Indian Agricultural Research Institute; Shri V. Krishnamurthy, Chairman, Bharat Heavy Electricals Ltd; Dr G. S. Laddha, Director, A. C. College of Technology, Madras University; Dr R. Siddiqui, Tata Institute of Fundamental Research; current Chairman, University Grants Commission; and President, Indian National Science Academy.

National Committee on Environmental Planning and Coordination

Two directors of CSIR laboratories, viz. Dr S. Z. Qasim (National Institute of Oceanography, Panaji) and Dr N. Majumder (National Environmental Engineering Research Institute, Nagpur) are among the members of the National Committee on Environmental Planning and Coordination. The committee has been recently reconstituted by the Department of Science and Technology for a period of two years.

Preventive Maintenance in Cement Plants : CRI Training Course

A 6-day training course on Preventive Maintenance in Cement Plants is being organized by the Cement Research Institute of India, New Delhi, from 31 March 1975.

The course is aimed at equipping the maintenance and production engineers in cement plants with the latest trends relating to planning, organization and operation of preventive maintenance systems in order to enable them standardize their strategies and implement them effectively.

CSIR Society Reconstituted

The society of the Council of Scientific & Industrial Research has been reconstituted for a period of two years ending with 31 August 1976, and consists of the following :

President

Prime Minister

Members

Shri C. Subramaniam
Union Minister of Finance, New Delhi

Shri P. N. Haksar
Deputy Chairman, Planning Commission, New Delhi

Prof. S. Nurul Hasan
Minister of Education, Government of India, New Delhi

Shri K. C. Pant
Minister of Energy, Government of India, New Delhi

Shri V. C. Shukla
Minister of State for Planning, Government of India, New Delhi

Dr M. S. Swaminathan
Director General, Indian Council of Agricultural Research, New Delhi

Dr H. N. Sethna
Secretary to the Government of India, Department of Atomic Energy, and Chairman, Atomic Energy Commission, Trombay, Bombay

Prof. M. G. K. Menon
Secretary to the Government of India, Department of Electronics, and Scientific Adviser to the Minister of Defence, New Delhi

Dr A. Ramachandran
Secretary to the Government of India, Department of Science & Technology, New Delhi

Chairman
University Grants Commission, New Delhi

Prof. R. C. Mehrotra
Vice-Chancellor, University of Delhi, Delhi

Dr J. J. Nerurkar
Managing Director, Sunita Laboratories, Indore

Shri J. M. L. Tambi
President, Federation of Associations of Small Industries of India, New Delhi

Shri N. B. Prasad
Chairman, Oil & Natural Gas Commission, Dehra Dun

Shri N. V. Amin
Managing Director, Jyoti Electricals, Baroda

Dr S. Varadarajan
Chairman, Indian Petro-Chemical Corporation Ltd, Jawaharnagar, Baroda

Shri M. S. Pathak
Chairman, Engineers India Ltd, New Delhi

Dr S. K. Mukherjee
Director (Production), Fertilizer Corporation of India, New Delhi

Shri G. K. Devarajulu
Shell House, Avnashi Road, Coimbatore

Dr M. S. Gore
President, Indian Council of Social Sciences Research, New Delhi

Dr P. B. Desai
Director, Institute of Economic Growth, University of Delhi, Delhi

The following members of the Governing Body of CSIR are also members of the Society (CSIR) for the period for which they are members of the Governing Body:

Director General
Scientific & Industrial Research, New Delhi (Chairman, Governing Body)

Nominee of the Ministry of Finance, Government of India (Shri H. N. Ray, Finance Secretary)

Prof. Jai Krishna
Vice-Chancellor, University of Roorkee, Roorkee

Shri N. P. Sen
Administrative Staff College of India, Hyderabad

Shri A. S. Rao
Managing Director, Electronics Corporation of India Ltd, Hyderabad

Five Chairmen of the following Coordination Councils :

(i) Engineering Group
(Prof. Dinesh Mohan, Director, Central Building Research Institute, Roorkee)
(ii) Chemical Sciences Group
(Dr M. G. Krishna, Director, Central Fuel Research Institute, Jealgora)
(iii) Biological Sciences Group
Dr S. H. Zaidi, Director, Industrial Toxicology Research Centre, Lucknow)
(iv) Physical and Earth Sciences Group
(Dr A. R. Verma, Director, National Physical Laboratory, New Delhi)
(v) Fibre Group
(Shri K. Sreenivasan, Director, South India Textile Research Association, Coimbatore).

FORM IV

(See Rule 8)

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I, Y. R. Chadha, hereby declare that the particulars given above are true to the best of my knowledge and belief.

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Science Cooperation between CSIR (India) and FSR (Iraq)

A Science Cooperation Agreement between the Council of Scientific & Industrial Research (CSIR), India, and the Foundation of Scientific Research (FSR), Iraq, was signed in New Delhi on 1 March 1975. Prof Y. Nayudamma, Secretary to the Government of India, and Director General, CSIR, on behalf of CSIR in India, and Dr Naji A. Kadir, President, Foundation of Scientific Research, on behalf of the Foundation of Scientific Research in Iraq, signed the agreement.

Some of the areas in which the two parties would cooperate are : construction designs and materials research, petroleum research, chemical and petrochemicals research, engineering and space research, as coming within the purview of CSIR, and other areas mutually agreed upon.

The two parties will exchange scientists and scientific information. CSIR will arrange for the recruitment of Indian experts for assignment at the Foundation of Scientific Research, Iraq. CSIR will also receive researchers and technicians sent by the Foundation for training in CSIR laboratories.

Dr Naji A. Kadir (first from left) and Prof. Y. Nayudamma signing the Science Cooperation Agreement

It was also decided to set up a joint committee consisting of the representatives from both parties to meet once a year alternately in Baghdad and New Delhi to review the progress of the agreement.

This agreement is in pursuance of the Cultural Agreement between the Republic of India and the Republic of Iraq signed on 19 April 1973, and with a view to strengthening the links of cooperation between the Council of Scientific & Industrial Research in India and the Foundation of Scientific Research in Iraq.

NPL Merit Awards

The National Physical Laboratory (NPL) Awards of Merit for 1975 were presented to three teams of scientists in recognition of their distinguished work relating to (i) development of liquid crystal thermal and electro-optical devices, (ii) development of techniques for X-ray topography, and (iii) design and development of Sodar—an instrument for the location and measurement of thermal and velocity inhomogeneities in atmosphere. Each merit award carried a cash prize of Rs 1000. Brief accounts of the award-winning contributions are given below.

The team consisting of Dr Subhas Chandra and Shri Sukhmal Chand Jain and assisted by Dr A. K. Sarkar & Sarvashri S. P. Suri, S. K. Kaicker and R. K. Medhekar under the guidance of Dr V. G. Bhide has developed the know-how for making a large variety of both liquid crystal thermal and electro-optical display devices. Using indigenously prepared cholesteric materials, this team has fabricated a variety of thermal devices which have

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been successfully used for thermography, for recording room and body temperatures, for mapping microwave intensity pattern, for the display of de-icing pattern on windshield, etc. The team has also developed the various processes for making liquid crystal electro-optical devices both of the dynamic scattering and the field effect type. These displays compare favourably with those made elsewhere in the world and are useful in digital clocks, digital instruments and desk calculators.

A camera for X-ray topography of single crystals has been developed by a team headed by Dr Krishan Lal and consisting of Sarvashri D. R. Pahwa, Vijay Kumar and Keshav Aggarwal. Techniques and equipment have been developed for the study of both the Lang and the Borrmann topography. These techniques clearly delineate a variety of imperfections such as grain boundaries, dislocations, and stacking faults in a crystal. These techniques were successfully used for the study of imperfections in a large number of crystals, and as a result have contributed substantially to the understanding of imperfections in crystals. A new and powerful tool has thus been made available for the first time in the country for the study of imperfections in crystals.

The team led by Dr S. P. Singal and consisting of Mrs M. Saxena & Sarvashri J. R. Anand, B. S. Gera and S. K. Aggarwal have succeeded in designing, fabricating and establishing 'Sodar', a unique facility, the only one of its kind in India and one of the few in the world for the location and measurement of the intensity of thermal and velocity inhomogeneities in the atmosphere—an information which can be used to infer and determine atmospheric processes and history. Sodar has tremendous potentialities in tropospheric monitoring for (i) troposcatter communication, (ii) micrometeorology, (iii) wind shear hazards, and (iv) atmospheric pollution.

Using this system successfully, these workers monitored inversion layers, meteorological disturbances, large-scale waves and other phenomena of direct interest to troposcatter communication. Sodar will be a great asset to the India Meteorological Department and the Department of Civil Aviation.

The awards were presented by Academician A. P. Vinogradov, Vice Chairman, USSR Academy of Sciences, on 17 February 1975 at NPL, New Delhi. Prof. Vinogradov delivered the Krishnan Memorial Lecture on 'The Metallic Phase of Planets and Meteorites'.

Planning of Branch Information Centres : Workshop at Insdoc

Branch information centres devoted to major disciplines play a significant role in the collection and dissemination of information for supporting R & D and other technological activities. Most of the CSIR laboratories have potential for setting up such subject-specialized information centres. These centres would form an integral part of the National Information System in Science and Technology (NISSAT) as envisaged in the Fifth Plan. To help CSIR laboratories and Cooperative Research Associations (CRAs) draw up plans for the development of information centres in their fields of specialization, the Indian National Scientific Documentation Centre (Insdoc), New Delhi, organized a workshop on 'Planning of Branch Information Centres in CSIR Laboratories and CRAs' from 25 to 27 February 1975 at Insdoc. Attended by more than 60 participants and observers from CSIR laboratories and CRAs, the workshop was inaugurated by Prof. Y. Nayudamma, Director General, Scientific & Industrial Research. Mentioning the role of information activities of CSIR laboratories, the Director General referred, in his address, to SWOT analysis wherein technological information figured as an important requirement. The inaugural address stressed (i) the need for identifying the information requirements of different types of clientele and for providing information-oriented services, (ii) the importance of management information service, and (iii) the need for coupling R & D with information. The Director General also stated that he had been advocating for the past three years the setting up of a technological information bank, but that it had not taken any concrete shape because of some unidentified gaps. For organizing branch

Workshop on Branch Information Centres in progress : Insdoc, New Delhi information centres, he felt, the CSIR laboratories had, to a large extent, the resources and facilities. Prof. Nayudamma concluded his address by expressing the hope that the workshop would examine critically the plans of the branch information centres within CSIR and make concrete proposals as a result of deliberations.

Four case studies relating one each to Food Science and Technology Information Service, Aeronautical Information Centre, Leather Information Centre and Environmental Engineering Information Centre were presented at the workshop. The basis for discussion was provided by working documents presented on such topics as : scope and objectives of NISSAT; survey of information needs and potentials; current awareness service; selective dissemination of information service; data service; translation service; document supply service; reprography service; union catalogue; and organization and planning of branch information centre.

The workshop recommended that the CSIR laboratories and CRAs may draw up plans for establishing branch information centres in their fields of specialization around the nucleus of facilities already available during the Fifth Plan period. As a first step, a survey of the existing resources and of the requirements of users might be undertaken. The workshop emphasized the need for creating a network through cooperation. It recommended that scientists from laboratories may be trained in data management, information analysis and computerized information processing. In view of the large store of information presently available in the CSIR laboratories and CRAs and the need for efficient utilization, it would be necessary to have computer facilities for processing information.

Textile Technology : Sixteenth Joint Conference

The sixteenth Joint Technological Conference sponsored by the Ahmedabad Textile Industry's Research Association (ATIRA), the Bombay Textile Research Association (BTRA) and the South India Textile Research Association (SITRA) was held at ATIRA on 27 and 28 January 1975. The object of these textile technology conferences is to provide an opportunity for scientists and technologists working in the textile and allied fields in the country to discuss the problems in their fields, exchange ideas and experiences and communicate the results of their work to industry. Nine research institutions contributed 27 papers in spinning, weaving, chemical processing, chemistry and engineering. About 700 delegates from all over India took part in the technical sessions.

In his introductory remarks, Shri Navnitlal Shodhan, Chairman, Council of Administration, ATIRA, stressed the important role played by the three research associations and stated that they had a great deal to offer the industry.

Delivering the key introductory address, Shri K. Sreenivasan, Chairman, National Textile Corporation, said that the Indian textile industry was characterized by a great deal of heterogeneity due to three factors : (i) presence of different sectors in the industry, viz. handloom, powerloom and the mill sector; (ii) tendency of the industry using different fibres to remain in separate, water-tight compartments; and (iii) considerable variation in the size, technological competence and efficiency even in the mill sector. Bringing about homogeneity and elimination of conflict are essential for the orderly development of the textile industry. Research institutions can play a prominent role in this by reducing the disparity in productivity and technological efficiency; by undertaking design, development and evaluation of machinery best suited to India; and reducing the cost of chemical finishing so that it can reach the common man. Other areas in which the research associations can actively contribute are the improvement in the performance of the decentralized sector and the assessment of new technologies.

Brief accounts of the papers presented at the technical sessions follow.

Spinning

P. Neelakantan and T. A. Subramanian (ATIRA) presented a paper entitled 'A model for the translation of fibre tenacity into yarn'. Earlier investigations had shown that Bogdan's intrinsic strength parameter was not entirely satisfactory for characterizing a cotton for yarn tenacity. The real yarn tenacity has now been postulated as derived by making an allowance for fibre obliquity and for the fibres that do not contribute to the yarn-breaking load. In the case of man-made fibres that do not exhibit a grip length effect for their tenacity the real yarn tenacity has been shown to be equal to the fibre bundle tenacity. On the other hand, the effective grip length for cotton has been found to depend upon the level of twist in the yarn, being of the order of 1 mm for yarns with more than the optimum twist.

The results of investigations carried out in the mills for getting improvements in yarn quality, performance and production on doubler frames were discussed by N. Balasubramanian and G. K. Trivedi of BTRA, Bombay.

S. G. Vinzanekar (VJTI, Bombay) made an attempt to explain the behaviour of yarn hairiness in the light of migration rate of the constituent fibres and other relevant factors. Certain interesting observations were made regarding distribution of protruding ends and loops based on an examination of tracer fibres. A close correlation was arrived at between the two classical measures of yarn hairiness, viz. N_1L_1 and index of total hairiness.

Earlier studies on lea strength variation of ring-spun cotton yarns had shown that analysis of covariance was a useful technique to determine the residual strength variance after accounting for the effect of count and twist. Further work carried out by A. K. Gupta, K. Ganesh and T. A. Subramanian (ATIRA) has revealed that the technique could be used to analyze the effect of spinning preparatory conditions on lea strength variation. It has been found that the wide differences in the spinning preparatory conditions by themselves do not affect the residual strength variance significantly. An explanation for this interesting finding was sought and applications of the finding under mill conditions were discussed by the investigators.

Engineering

Fluidics is comparatively a new technology in which fluid phenomena such as wall attachment and interacting jets in specially designed passages are usefully employed. Its applications cover a wide range from machine tool, marine engineering and process industries to medicine. Fluidic control systems can, in some places, advantageously substitute the electronic control systems, as the former can operate in severe environmental conditions and have greater reliability. A few applications of fluidics in textile industry were discussed by D. B. Trivedi and Subir Kar of the Indian Institute of Technology, Bombay.

ATIRA has carried out studies on the heat utilization efficiency and reuse of 'waste heat'. The heat utilization efficiency factor (HUEF) has been evaluated by J. S. Parajia, M. Ratna Prabhu and K. Subrahmanyam. This factor can help keep a check on the efficiency of heat utilization in a mill. J. S. Parajia and P. B. Jhala (ATIRA) discussed the methods of waste heat recovery from various sources and the consequent savings in fuel consumption.

Wet Processing

K. Mythili, R. C. Gupta, G. L. Bhalla and J. L. Handu (Shri Ram Institute for Industrial Research, Delhi) presented the results of a comparative study of caustic soda and liquid ammonia pre-mercerization treatments on the properties of D. P. cotton fabrics. Caustic soda as well as liquid ammonia mercerization treatments were carried out on 3/1 and 3/2 twill and plain weave tussore fabrics. These mercerized fabrics were further subjected to crosslinking treatments in the laboratory using DHDMEU resins. The data obtained on absorption properties indicate that liquid ammonia mercerized fabrics exhibit higher baryte ratio and lower moisture content than caustic soda mercerized fabrics. It has been found that caustic soda pre-mercerized fabrics show higher retained breaking strength, elongation at break and toughness as compared to liquid ammonia mercerized fabrics after crosslinking treatments. However, flex abrasion resistance of liquid ammonia pre-mercerized fabrics (3/1 twill and plain tussore fabrics) has been found superior to that of caustic soda pre-mercerized fabrics.

The results of studies made at ATIRA on several carbamates as carriers in disperse dyeing of polyester-cotton (67:33) blend fabric were presented by H. U. Mehta *et al.* Chlorinated benzene and ester type carriers were used as reference substances. Lauryl- and octyl-carbamates gave yields as high as reference carriers; benzyl- and stearyl-carbamates gave equal or slightly poorer yields. Fastness to wet rubbing, light and washing, and dyeing of cotton portion have been investigated. Low-temperature dyeing (at 75°C) with certain carriers has also been carried out. The results show that carrier concentrations required for dyeing are higher at lower temperatures. However, the fastness properties of the dyeings are not impaired.

Simple relationships between the alkali centrifuge value (ACV) and the mechanical properties of the treated fabrics have been established by G.M. Venkatesh *et al.* (ATIRA). ACV has been found to be linearly related, with a high degree of correlation, to the dry crease recovery angle $(W+F)^\circ$ of the fabric. Similarly, the percentage reduction in ACV, as a result of crosslinking, could be correlated with the percentage tensile loss, tear loss and flex abrasion loss.

ACV of treated fabrics is a measure of their swelling capacity and is a single parameter which can characterize resin-treated fabrics. The effects of fabric weave and of swelling at the time of crosslinking were also discussed by these workers.

Knitting

K. P. Ramakrishna Pillay and K. Ranganathan (SITRA) discussed the techno-economic feasibility of using spun yarns for warp knitting. The yarn quality for optimum knitting performance has been calculated from the relationship between yarn properties, machine speeds and fabric designs on the one hand and knitting performance and fabric properties on the other hand. The comparative cost of production of woven and knitted fabrics as well as the economics of warp knitting as compared to weaving has been determined. The conditions under which investments on warp knitting would be worthwhile have also been assessed.

Symposium on Fish-processing Industry

A two-day symposium on Fish-processing Industry in India, jointly organized by the Association of Food Scientists and Technologists (India) and the Central Food Technological Research Institute (CFTRI), Mysore, was held at CFTRI on 13 and 14 February 1975.

Nearly 150 specialists in fish-breeding, resources location, landing techniques, processing technology, quality control and marketing participated. Delegates to the symposium were drawn from the Marine Products Export Development Authority, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Fisheries Development Corporations and Fisheries Departments of state governments, Defence organizations, and industrial organizations. Delegates from Australia, Denmark and Norway also participated. The symposium was spread over six technical sessions besides a plenary session at which the following recommendations were made.

Recognizing the need for a continuous survey of pelagic and demersal fisheries resources, the symposium called for the setting up of dissemination services to feed the industry with information on the location and availability of fishes.

Large-scale handling and processing of pelagic fishes should be done in centralized places and not in scattered places as had happened in the case of shrimp-handling and processing.

Government should take urgent steps for exploitation of tuna fish resources of India's waters.

A crash programme should be launched to develop improved methods of handling, processing and distribution of freshwater fish.

In regard to freezing of fish, it was felt that further investigation would be necessary to determine quality aspects of shrimp/fish frozen by different freezing methods. The two important commercial varieties of fish, viz. oil-sardine and mackerel, needed utmost attention as regards freezing so that the stored, frozen product has a minimal shelf life of six months. Greater attention was also needed for freezing fish meat and fillets, both for internal consumption and export.

It was urged that the technological problems relating to commercial production of processed shell fish like clams, mussels and oysters, of which India has sizable resources, might be looked into by research and development laboratories.

The symposium made a plea that government and government-aided agencies might use low-cost fish products developed by research laboratories and of proven acceptability, in community feeding programmes. Inexpensive varieties of fish could be used for making fish sausage, which would be a readily marketable product. The possibility of producing fish sausages in natural casings might be explored for distribution through cold chain.

The symposium stressed the need to improve the technology of traditional fish products which are generally consumed by the poorer sections of the population. It was suggested that clear and detailed guidelines might be laid down for the production of (i) sardine oil of standard quality, and (ii) fish meal of quality specified in the national and international standards. Complete project and feasibility reports should be drawn up for the utilization of waste from fish-processing industry, and of inexpensive fish for industrial or edible purposes.

The need for design and development of suitable machinery to mechanize certain operations of fish-processing was recognized. It was recommended that research organizations should take up work on the development of know-how and machinery for the manufacture of processed products.

It was also recommended that periodical refresher/training courses on sanitation and hygiene, and processing of special products should be conducted by established research and development institutions.

Get-together of Scientists, Architects, Designers and Engineers

A get-together of architects, designers, engineers and scientists was organized by the Central Building Research Institute (CBRI), Roorkee, at Shahdara, Delhi, on 24 February 1974 with a view to demonstrating some of the CBRI techniques adopted by the Life Insurance Corporation of India for constructing 320 four-storeyed dwelling units at Shahdara. A large number of delegates from the Corporation, Central Public Works Department, Military Engineers Services, Railways, Delhi Development Authority, New Delhi Municipal Committee and Municipal Corporation of Delhi attended the get-together.

Prof. Dinesh Mohan, Director, CBRI, while addressing the gathering, thanked the Chairman, LIC, for inviting CBRI to advise them on efficient and economical planning and construction of houses at Shahdara. He highlighted the CBRI techniques, viz. compacted under-reamed piles for foundation; single-brick load-bearing walls in all the floors; precast thin lintels, sunshades and shelves; precast cored units and solid planks for floors and roofs; and single-stack system for plumbing, the adoption of which not only reduced the construction time but led to appreciable savings in scarce materials (cement and steel) and overall cost of construction. He specifically pointed out that pile foundation alone worked out to be 25% economical than the raft foundation generally used in such soil conditions. The use of single-brick-thick walls in all floors had resulted in 20% saving in the cost of brick masonry apart from giving increased floor space in the lower two floors. He said that 7·5 cm thick precast lintels had effected an overall saving of 30% in cost as compared to traditional *in-situ* reinforced concrete lintel. The R. C. cored units and solid planks had resulted in savings of about 17% concrete and 7% steel as compared to *in-situ* R. C. slabs and achieved a construction rate of 1 house in 2 days. Regarding building drainage Prof. Dinesh Mohan mentioned that the single-stack system of plumbing which had been adopted in these houses, excepting a few blocks, effected a saving in material and overall cost of piping to the extent of 45% and 60% respectively in comparison to conventional two-pipe system.

The Director further stated that all these techniques were simple and only required good supervision and quality control. He said that the CBRI techniques had also been adopted by some other construction agencies and desired that other departments should also adopt these techniques in their construction.

Shri K. L. Puri, Chairman of LIC, who presided over the inaugural function, appreciated CBRI's role in providing an economical and efficient housing design, and assured that LIC would be adopting CBRI's techniques in their future constructions also.

An exhibition-cum-demonstration of the various CBRI techniques was also arranged. A discussion was also held when CBRI's scientists answered the questions raised by participants. There was general appreciation of the CBRI techniques and some of the participating organizations expressed desire to adopt them.

SASMIRA's Silver Jubilee

The Silk & Art Silk Mills' Research Association (SASMIRA), Bombay, which completed 25 years of its services to industry on 12 January 1975, is observing 1975 as its silver jubilee year. The celebrations were formally inaugurated at a function organized on 15 January 1975. The programme included a series of lectures and an exhibition of textile instruments developed by SASMIRA.

In his welcome address Shri D. N. Shroff, President of SASMIRA, highlighted the contributions of the Association to the man-made textile industry, and expressed the hope that a pilot plant for production of nylon and polyester fibres would be set up soon with financial aid from UNDP and the Federal Republic of Germany. It was also intended to set up a regional centre at Surat with assistance from the Gujarat Government and the industry. Earlier, the Director of SASMIRA, Shri J. G. Parikh, traced the history of the Association.

The lecture series started with a talk on 'Future of man-made fibres' by Mr E. W. Olingschlaeger, Chief Executive and Director, Fibres Division, Bayer UK Ltd. Remarking that the worldwide availability of natural fibres was inadequate to meet the requirements of the textile industry, Mr Olingschlaeger said that the problem could be solved by finding new feedstock material or by diverting the priorities of refineries towards petrochemicals production.

CMRS Develops Tubular Friction Prop

A light-duty tubular friction prop for use as mine support has been designed and developed by the Central Mining Research Station (CMRS), Dhanbad. Developed for the first time in India, the prop will replace timber supports which are scarce in the country. The capacity of the prop ranges from 10 to 15 tonnes. Its approximate weight is 22 kg and the maximum yield is 1·4 m at 3 m height. It can be manufactured entirely from indigenous materials at a very reasonable cost. The salient features of the prop are portability, easy maintenance, and accurate performance; also, it is easy to set, withdraw, dismantle and shift.

The prototype was tested under simulated mine conditions and found satisfactory.

New Stationary Phases of GLC

Polyester stationary phases having medium polarity and good thermal stability are widely used for analysis of varied types of intricate mixtures by gas-liquid chromatography (GLC). A better separation of hitherto unresolvable mixtures may be effected by changing the chemical structure of the polyesters. With a view to studying the utility of polyesters in the separation of mixtures by GLC, a number of polyesters of varying structures were synthesized by Shri Kharak Singh Uppal who carried out studies under the guidance of Dr B. B. Ghatge at the National Chemical Laboratory (NCL), Poona.

A series of polyesters prepared from 1, 4-butenediol and succinic, adipic, sebacic, and 1, 16-hexadecanoic dicarboxylic acids was investigated as substrates for effecting the separation of terpenoids. The unsaturated centre in the polyester was found to have a profound influence on the retention time. Since the retention times of hydrocarbons and neutral oxygenated compounds varied linearly with the intervening methylene groups in acid fragment of up to C_{16}-dicarboxylic acid it was possible to effect separation of several overlapping terpenoids. An attempt was made to study the relationship of retention time with the increase in the number of methylene groups. The polyesters chosen for the purpose could be represented by the general formula $(-O-CH_2-R-O-CO-)_n$ where R is CH_2-CH_2-, $-CH_2-CH_2-CH_2-$, $-CH_2-CH_2-OCH_2-CH_2-$, $-CH_2-CH=CH-CH_2-$, or $CH_2-(CH_2)_3-CH_2-$.

To study the gradual transition effect from the unsaturated centre to the aromatic nuclei in polyester substrates, simple phthalic acid esters with alcohols of up to 9-carbon chain were prepared and studied as liquid phases; and interesting relationships were observed, however, with low-temperature stability.

Polyesters were also synthesized from phthalic acid with various glycols ranging from ethyleneglycol to 1, 10-decanediol and their performance as liquid substrates was studied for separating aliphatic, alicyclic and aromatic compounds. Some of the polyesters were found to be good solvents, particularly for aromatic derivatives and their isomers. For further effectiveness, polyesters from fluoro-, chloro-, dichloro-, and amino-substituted phthalic acids with 1, 5-pentanediol were developed and studied for separation of toluidines, chloro-, nitro-chloro-, amino-chloro-benzenes, cresols, etc. Some of them were found to be good substrates for isomeric derivatives under normal analytical conditions.

A method was standardized for quantitative estimation of chlorobenzene isomers using an amino-polyester as substrate.

These investigations were made using fire-brick (prepared in the laboratory) as a solid support.

Shri Uppal was awarded the Ph.D. degree by the Poona University for his thesis based on these studies.

Progress Reports

CRI Annual Report : 1973-74

The annual report of the Cement Research Institute of India (CRI), New Delhi, for 1973-74 has been published recently. The report shows that the institute continued to focus its attention on the completion of the phased infrastructural development in order to provide technological support to the cement and allied industries. It had completed 40 R & D projects of which 28 were sponsored ones. The institute was actively engaged in the design and development of the first 2000 tonnes/day (or larger size) cement plants under a programme of the National Committee on Science and Technology. The institute was also pursuing the development of mini cement plants with capacities of 20-50 tonnes/day range. CRI provided expertise in standardization efforts in the field of its activities.

The institute made investigations on the utilization of high-magnesia limestone, paper and asbestos sludge, and fly ash in the manufacture of cement. Studies were carried out to identify the causes of chemical attack on the reinforced concrete structure of the nitro-limestone plant building of the Hindustan Steel Ltd, Rourkela, and recommendations for a corrosion-resistant protective coating and methods for carrying out repairs to the deteriorated concrete were made available.

The institute completed the dynamic analysis for the 170-m high, doubly-curved arch dam at Idikki in Kerala, for maximum reservoir level and for upstream/downstream motion condition caused by an actual earthquake accelero-technique. The adequacy of sheer keys was checked using the theoretical normal and shear stresses obtained for the critical sections.

Geological investigations made by CRI on the site of a fertilizer complex revealed that the high concentration of sulphates and chlorides in the soil would be extremely harmful to the ordinary portland cement concrete piles driven in the soil. The total cost of the project undertaken by the Mangalore Fertilizer and Chemicals Ltd was about Rs 600 million of which the expenditure on foundation construction was about Rs 15 million. The institute made available recommendations relating to the choice of cement and type of piles, size of piles, concrete for the piles, reinforcement and surface coating.

At the request of the Central Public Works Department, the institute made investigations on the uniformity and strength of the concrete and actual depth of the slab laid for the runway at Palam Airport. A suitable technique for extracting cores from a field depth of 40·6 cm was developed for this purpose.

The institute has standardized an EDTA method for estimating the manganese content in slags, slag cements and manganese-bearing limestones using thymol phthalexone as indicator. The method is quite rapid as compared to the conventional gravimetric method and is comparable to the latter in accuracy. The institute has also standardized colorimetric methods for the estimation of phosphorus pentoxide and chloride in cement, limestone, fly ash, slag, slag cement and fly ash cement.

Following the investigations made at CRI laboratories and at the cement plants, five alternative designs for cement-packing had been arrived at. Field trials for actual supply of cement in these bags have shown encouraging results.

The institute completed the work on theoretical estimation of heat losses through refractory linings and kiln shell, and refractory surface temperatures with and without insulation layer between rotary kiln shell and various types of refractory linings of uniform thickness. The heat losses appeared to be influenced both by the nature of the refractory lining and the insulation material.

Technology transfer services constituted a vital section of CRI's activities. The activities covered under these services are cement and concrete standard reference service, standardization, quality control, industrial extension, publications, display and expositions.

CSIR Support To Research

New Schemes

Studies in Liquid Crystalline State

Nematic liquid crystals find a number of applications in display devices, as stationary phase in gas-liquid chromatography and as solvents in spectroscopy. Usually, low-melting liquid crystals are used for this purpose. The majority of nematic liquid crystals consist of rod-shaped molecules with polar groups at either end; this arrangement apparently favours the parallel orientation characteristic of the nematic mesophase. The central part of such a molecule must then consist of linear, or nearly linear, groups. It is found that *p*-phenylene group is particularly convenient for this kind of arrangement because it is linear and quite rigid. Thus a majority of known nematic liquid crystals contain one or more *p*-phenylene groups. A change in molecular architecture can radically alter the liquid crystallinity of a compound and affect its thermal stability. Some of the earlier studies made by Dr J. S. Dave and coworkers at the Department of Chemistry, M. S. University of Baroda, Baroda, have shown that the thermal stability of a liquid crystalline compound can be reduced by the introduction of a 1, 4-substituted naphthalene moiety in the molecule.

It is also found that the thermal stability and the plot of the transition temperatures against the number of carbon atoms in the alkoxy chain are influenced by the terminal substituents. In some cases the imbalance of the terminal groups in a molecule brings about an ascending tendency for the nematic-isotropic transition curves.

In a new CSIR scheme sanctioned to him, Dr J. S. Dave (principal investigator) proposes to synthesize new low-melting mesogens—nematic and smectic—and to study their mesomorphic properties. It is also proposed to study the binary and ternary mixtures of these compounds so that their eutectics may be still brought down to obtain a convenient system for commercial exploitation. The study is expected to throw more light on the mesomorphism and chemical constitution of an organic compound.

Structure, Ore Petrology and Geochemistry of Manganese Ores of Srikakulam District

A new CSIR research scheme on the above topic has been sanctioned to Dr J. S. R. Krishna Rao (principal investigator), Reader, Geology Department, Andhra University, Waltair. The main object of the study is to collect data for the exploration of manganese ores.

The study comprises structure, mineralogy, petrography and petrochemistry. Structural, lithological and stratigraphical controls of manganese ores will be studied mine-wise for generalization. Mineral facies and metamorphic paragenesis study for ores and ore-bearing rocks forms an important aspect. The geochemical conditions of deposition of manganese ores in the area will be formulated on the basis of chemical data. The genetic relation of ores with the rocks in the area will be examined in order to facilitate prospecting. It is also proposed to examine the deleterious elements in the ores of this district for industries and their possible elimination by processing.

Preparation of Rubber-reinforced Thermoplastics

In a CSIR research scheme granted to him, Dr R. T. Thampy, Director, Shri Ram Institute for Industrial Research, Delhi, in association with Dr S. R. Nair, Research Officer of the Institute, proposes to carry out investigations on the suspension copolymerization technique for the preparation of rubber-reinforced thermoplastics using polybutadiene, styrene-butadiene copolymers, acrylic rubbers and ethylene-propylene-diene terpolymers (EPDM) as the reinforcing rubbers. It is known that the impact resistance of rigid thermoplastics can be considerably enhanced by the incorporation of an elastomer as a reinforcing component without reducing the rigidity or affecting other mechanical properties. The properties of the copolymers thus obtained will be studied in comparison with those of products obtained by the conventional emulsion copolymerization technique. Attention will also be given to the development of suitable suspending agents.

PATENTS FILED

2460/Cal/74 : A strain gauge torque transducer, V. R. Singh, (Km.) S. Jain & R. Parshad—NPL, New Delhi.

2461/Cal/74 : Improvement in or relating to the manufacture of *o*-toluidine from *o*-nitrotoluene, P. C. Rajkhowa, B. K. Paul & J. N. Baruah—RRL, Jorhat.

2462/Cal/74 : Improvement in or relating to the manufacture of tricresyl phosphate (pure or isomeric mixture) from cresol (pure or isomeric mixture) and phosphorous oxychloride, V. N. Gupta, R. K. Mathur & J. N. Baruah—RRL, Jorhat.

2463/Cal/74 : A process for the production of metol (*N*-methyl-*p*-aminophenol sulphate) from *p*-nitrophenol, R. C. Rastogi & J. N. Baruah—RRL, Jorhat.

2504/Cal/74 : An improved header die for making sintered glass headers, N. C. Gupta & S. Chander—CEERI, Pilani.

2506/Cal/74 : An apparatus for measuring the maximum pore radius of filter media treated with phenol-formaldehyde resins, A. Majumdar, S. R. Ghosh, B. P. Chaliha, U. Choudhury & S. K. Rao—RRL, Jorhat.

2507/Cal/74 : A process for the preparation of 2,2′-dichlorohydrazobenzene from 2,2′-dichloroazoxybenzene, R. N. Baruah, B. K. Paul & J. N. Baruah—RRL, Jorhat.

2551/Cal/74 : A process for the synthesis of 2,3,4-triphenylfurans and 2,3,4-triphenyl-5-alkylfurans carrying a hydroxy or *tert*-aminoethoxy substituent in one of the phenyl rings, D. K. Dikshit, K. L. Munshi, R. S. Kapil, N. Anand, V. P. Kamboj & A. B. Kar—CDRI, Lucknow.

2553/Cal/74 : A process for the production of neutral barium/calcium petroleum sulphonates in mineral oil from petroleum sulphonic acids (mahogany acids) and sodium petroleum sulphonates (crude) detergent-dispersant additives for motor oils, O. N. Anand, V. P. Malik & K. S. Anand—IIP, Dehra Dun.

2765/Cal/74 : Improvements in or relating to a column leaching for the removal/recovery of one or more constituents from a ore/mineral/chemical mixture of several constituents and thereby beneficiating the original material or recovering the valuables, S. K. Jain & P. K. Jena—RRL, Bhubaneswar.

CRI Training Course Postponed

The training course on Preventive Maintenance in Cement Plants [*CSIR News*, **25** (1975), 39] will be held from 15 to 20 September 1975 at CRI laboratories at Ballabgarh.

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Dr Atal Appointed Director, RRL, Jammu

Dr C. K. Atal has been appointed Director, Regional Research Laboratory (RRL), Jammu; he took charge on 21 March 1975. Dr Atal has had a brilliant academic record and a distinguished career backed by extensive experience in conducting basic and applied research He has a basic degree in pharmacy, a master's degree in botanical sciences and doctorate degree in the chemistry of natural products from the University of Connecticut, USA. He was acting chairman of the Department of Biological Sciences, Creighton University, Nebraska (USA) and head of the Department of Pharmacognosy, Panjab University, from 1959 to 1964, before he joined RRL, Jammu, as Assistant Director. At this laboratory he was successively placed as head of the Department of Phytochemistry, Department of Plant and Agro Sciences and Department of Applied Botany till 1971 when he became head of the laboratory as Scientist-in-charge. He was appointed Deputy Director-in-charge in February 1973.

With a rare combination of knowledge of botany, chemistry and pharmacy, Dr Atal has conducted researches on many important medicinal and aromatic plants. He has to his credit 150 research papers and a large number of patents in India and in foreign countries. Two of the processes developed by him have been commercialized. Dr Atal is internationally known for his work in the field of pyrrolizidine alkaloids and chemistry of the constituents of various *Piper* species. He has guided a large number of research scholars who have obtained their doctorate degrees from the universities of Jammu and Panjab in the fields of organic chemistry and pharmaceutical sciences.

Dr Atal played a key role in reorienting the programmes and policies of RRL, Jammu, after he became head of the laboratory in 1971. He introduced for the first time industrial consultancy programmes and involved the laboratory more and more with industry-sponsored work.

Dr Atal is a life member of the Society for Economic Botany (USA). He is also a member of the Panel of Experts for Pharmaceutical Education under the Union Ministry of Health, and member of the advisory board of the Indian Journal of Pharmacy. He is chairman of the Research and Development Committee for Jammu and Kashmir.

Dr Atal visited Poland on a lecture tour under invitation from the Polish Academy of Sciences during 1972. He was chairman of the Phytochemistry Session of the American Pharmaceutical Association in 1974.

Dr R. L. Datta

Dr R. L. Datta of the Central Salt and Marine Chemicals Research Institute, Bhavnagar, has been elected Vice President of the International Solar Energy Society. He has been a member of the board of directors of the Society.

Dr Datta has become, on invitation, a member of the board of directors of NGR : Resources Recovery Inc., New York, USA. The company is concerned with the development and application of technologies in energy conservation, utilization of alternative sources of energy like solar energy, wind power, tidal and geothermal energy, and waste recycle for efficient utilization of energy.

Institution of Engineers' Prize for CRRI's Paper

A technical paper [*J. Instn Engrs India*, **54** (1974), 93] of the Central Road Research Institute (CRRI), New Delhi, entitled 'Rapid transit system for Delhi' by N. S. Srinivasan, Ishwar Chandra, Y. Suryanarayana, B. L. Suri and Anand Prakash has been awarded the President of India's Prize of the Institution of Engineers for the year 1973-74.

The paper reports the results of a study conducted by CRRI on the rapid transit system for Delhi. From field studies, the nature and characteristics of intra-city passenger trips were determined. Multiple regression analysis was carried out to establish the relationships between trip production and attraction and factors influencing travel, and using these relationships, the total 'person trips' in Delhi in the year 1981 were determined. These trips were then distributed to determine the future travel patterns. Taking into account the future travel patterns, land use and socio-economic factors, a suitable rapid transit system has been worked out. The assignment of trips showed that this system will cater to a demand of 2 million passenger trips out of a total demand of 2·76 million passenger trips by mass transportation in the year 1981. The remaining 0·76 million pas-

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28 APR 1975

senger trips will have to be met by the 'bus system'. In the study, rapid transit and buses have been taken as complementary and supplementary to each other.

The paper has also highlighted the method of economic evaluation in the choice of the most suitable system of rapid transit corridors out of different alternatives.

Symposium on Sizing : SASMIRA

A symposium on 'Sizing' was organized by the Silk and Art Silk Mills' Research Association (SASMIRA), Bombay, on 26 February 1975 at SASMIRA. Inaugurating the symposium, Shri A. K. Bhagwati, Managing Director, Associated Textiles Engineers Pvt. Ltd, complimented SASMIRA for its multifarious activities and rendering useful services to its members, who included manufacturers of synthetic yarns of various types, processors of synthetic filament yarns, weavers and knitters and processors of fabrics made from synthetic filament yarns. SASMIRA's activities also included assistance to its members manufacturing machinery for the filament yarn weaving and knitting industry. Commenting on the technology of sizing, Shri Bhagwati said that special techniques, chemicals and sizing agents had to be utilized for obtaining good and properly sized yarn for high-speed weaving. Also, proper sizing could not be achieved without the availability of good and modern machines. The country had reached a stage where development of better machines for introduction of newer technology for application of newer type of fibres and for improving the existing performance was possible.

While welcoming the delegates, Shri J. G. Parikh, Director of SASMIRA, said that the world demand for textiles was rising rapidly, and that the demand had to be met with increased production facilities. Production of various yarns such as synthetic filaments, spun and blended yarns of different fibres and their combinations, besides the growing use of texturized yarn in weaving, had necessitated reviewing of sizing techniques. The symposium was meant to offer an opportunity for technologists to discuss the latest trends and exchange information on the subject, the Director said.

In the technical session, two papers on sizing were presented. The first paper on 'Sizing of polyester/cotton blends', presented by A. L. Shevde (Rajesh Textile Mills Ltd, Bombay), discussed the properties and selection of sizing ingredients, preparation of the size and also precautions to be taken during its application. The second paper on 'Sizing of continuous filament yarn', by K. K. Vidurashwatha (Century Enka Ltd, Bombay) and S. V. Sankar (SASMIRA) dealt with the recent developments in the weaving of man-made fibre continuous-filament yarns, leading to the modification and improvements in the sizing process. Theoretical and practical aspects of sizing filament yarns including the sizing materials used, the preparation of the size mixing, the sizing conditions and precautions to be observed during beam preparation were also discussed in the paper.

The recommendations made as a result of the discussions at the symposium are summarized below.

Beam preparation

It is necessary that the back beams supplied to the sizing machines should be bound with the same tension during the warping process. The tension during warping should be maintained between 0·05 and 0·10 g/denier.

Sizing conditions

(1) *Sizing recipe* : The sizing recipe for different fibre blends such as polyester/cotton, polyester/viscose, polyester/viscose/cotton, as also for spun acrylic yarns, depends more on the yarn counts than on the type of fibre used.

(2) *Hardness of squeeze rollers* : The hardness of squeeze rollers is 60° shore hardness for viscose and acetate rayon filaments and 60-70° shore hardness for nylon and polyester filaments.

(3) *Antifoaming agents* : Normally, foaming can be reduced by maintaining the minimum temperatures recommended for a particular size mix. If the foaming does not cease in spite of this precaution, it would be advisable to use silicone defoaming agents.

(4) *Stretch percentage* : The total stretch percentage at the sizing machine should be maintained as follows : filament viscose rayon—4%; polyester/viscose, polyester/cotton and polyester/viscose/cotton blends—2%; nylon and polyester flat zero twist yarn—0% or a contraction of 1%; nylon and polyester twisted yarn—less than 1%.

(5) *Static charges* : A high-voltage eliminator at a head-stock of the sizing machine could be used for overcoming difficulties due to static charges. Application of antistatic oil to the warp between the last drying cylinder and the head-stock is also recommended.

Formation of fuzz balls

Formation of fuzz balls during the weaving of sized viscose filaments occurs because of improper size adhesion to the yarn. Proper size preparation and maintenance of the temperature of the size box should eliminate the formation of fuzz balls.

Research and Industry Get-together at CMRS

The Central Mining Research Station (CMRS), Dhanbad, organized, in collaboration with the Central Fuel Research Institute (CFRI), Dhanbad, a get-together between research workers and industry on 8 & 9 March 1974. The get-together was divided into eight technical sessions; problems of mining were discussed in five sessions, and three sessions were devoted to coal utilization.

The need for finding the feasibility of adopting open-cast method of mining, hydro-mining, partial extraction without stowing and longwall method of mining to extract the coal locked up in the existing pillars was stressed in the session devoted to 'Methods of Working'.

In the technical session on 'Ventilation, Fires and Explosions', it was recommended that the size of the ventilation fans, air locks and stoppings should be standardized. Data on ventilation in various mines should be tabulated and published for the benefit of the industry. Development of a sensitive, carbon monoxide detector for determining the incipient heating in coal was recommended. It was suggested that the possibility of using clay and earth for blanketing to control mine fire should be looked into and explosion-proof stopping should be standardized.

The session concerned with safety and health recommended that machines should incorporate built-in devices for safety and that investigations relating to noise and dust control should be intensified. An experimental mine should be entirely devoted for research work.

At the session devoted to strata control and stowing it was made known to participants from industry that CMRS had built up expertise in the field of equivalent material model study, design of pillars and stooks during depillaring operation, roof bolting, prediction of roof falls and surface subsidence and extraction of coal below townships. The industry was urged to avail itself of the expertise. It was also suggested that CMRS should work out a method for extracting 550 million tonnes of coal locked up in the pillars and to build up a data bank of physico-mechanical properties of coal-bearing rocks in India.

The need for standardization and rationalization of the various mining equipment to facilitate the industry in future planning and production was stressed in the session devoted to mine engineering. There should be an experimental mine for testing the various equipment to the satisfaction of the users.

The get-together was inaugurated by Shri J.G. Kumaramangalam, Chairman, Coal Mines Authority Ltd. An industrial exhibition was also held at which indigenous mining equipment and machinery from 40 organizations were displayed.

VITM's Science Fair

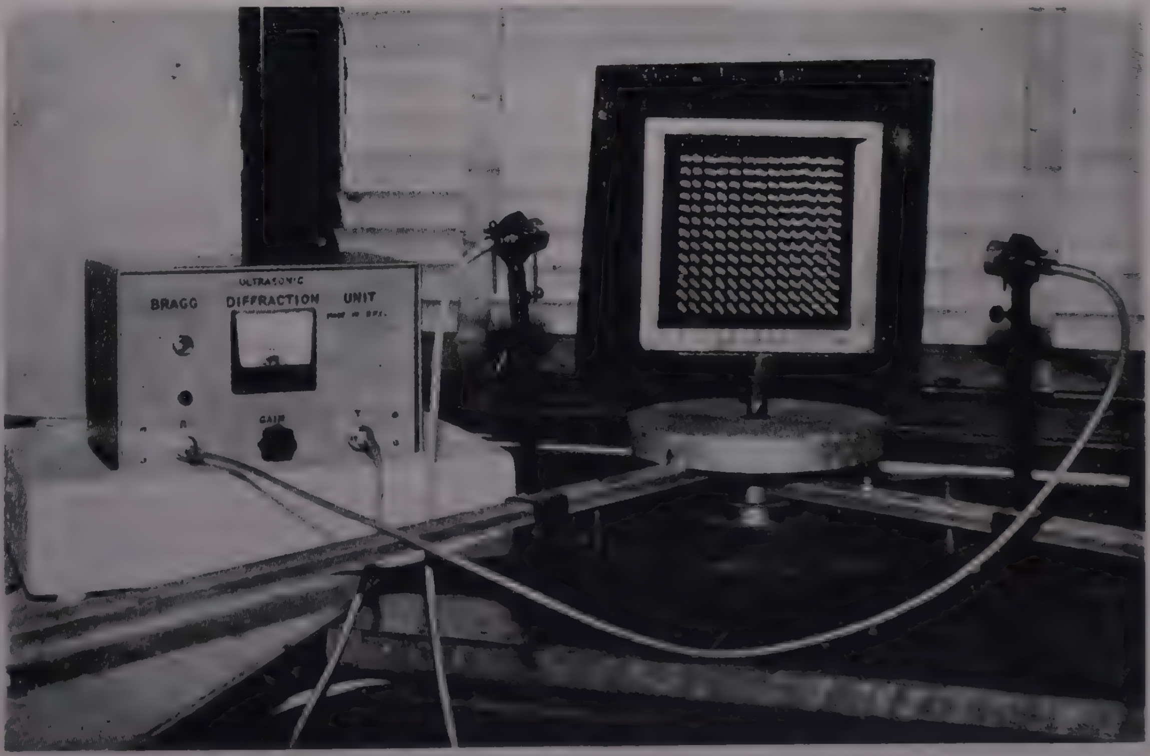
The Visvesvaraya Industrial and Technological Museum (VITM), Bangalore, organized a students' science fair, an annual feature of the activities of VITM, from 18 to 22 January 1975. Fifty-four schools from 7 districts participated in the fair at which 150 exhibits made by students were displayed. The fair was preceded by district-level science fairs in six districts of Karnataka. Thirteen industries had instituted special prizes of Rs 100 each, in the form of hand tools, for being awarded to the best exhibitors. VITM awarded three prizes in the form of books and kits. The number of scholarships awarded by VITM was increased to three, of value Rs 40, Rs 30 and Rs 20 per month for two years. An important feature of the fair was the institution of two awards of Rs 600 and Rs 400, in the form of books, for the best schools participating in the fair, by the Visvesvaraya Industrial Museum Society Trust, Bangalore.

Device for Studying Bragg Law of Diffraction

Dr Bindal (NPL) Wins NRDC Award

A simple device for demonstrating the Bragg law in laboratories has been developed by Dr V. N. Bindal at the National Physical Laboratory (NPL), New Delhi. The device makes use of ultrasonic waves of suitable wavelength produced with the help of ultrasonic air transducers. The experiment, therefore, can be performed without using X-rays, a procedure fraught with radiation and high-voltage hazards.

The set-up consists of a crystal lattice analogue made of thin wires and plastic beads placed on the table of a goniometer. The two ultrasonic air transducers (one connected with transmitter and the other with receiver) are mounted on the two booms of the goniometer. A graph is plotted between the angle θ (which the incident and reflected beams make with the lattice plane) and the current reading in the receiver. A peak in the graph gives the value of angle θ to be substituted in the Bragg relation $n\lambda = 2d \sin \theta$. Since the values of wavelength (λ) and interplanar spacing (d) are known, the law can be easily verified.



Device for studying Bragg law of diffraction : NPL, New Delhi

In order to take into account the background reflection from the walls of the room, it is necessary to take readings with the lattice analogue as well as without. The readings without the lattice are also plotted to make sure that the peak is due to lattice and not due to background reflections.

Dr Bindal has won the NRDC Republic Day (1975) award of Rs 1000 for developing the device.

Separation of Alkaline Earth Elements : CGCRI Develops Method

The need for a simple method for the separation of the alkaline earth group elements, specially the separation of barium and strontium, had for years been an intricate problem in analytical chemistry. The usual method is based on the separation of the alkaline earths as sulphates in the presence of ethanol. Lead (if present) is precipitated out as sulphide. Barium and strontium are then separated as chromates by metathesis. The method is complicated and time-consuming, and analysts have been in search of a simpler method for separating barium and strontium as sulphates on semi-micro scale.

A method based on indirect complexometric titration of barium and strontium after stepwise precipitation as sulphates from homogeneous solutions developed at the Central Glass & Ceramic Research Institute (CGCRI), Calcutta [*Analyst*, **98** (1973), 289-292] attracted the attention of Prof. R. Balchar of the University of Birmingham (UK). At his instance, collaborative work on developing a simple method for the separation of alkaline earth elements on semi-micro scale was initiated and completed at CGCRI. Following a successful trial for two years in the laboratories of the University of Birmingham, the method is being incorporated in Midlands Association for Qualitative Analysts book of Qualitative Analysis.

The method is based on the separation of barium and strontium (lead also, if present) as sulphates from the other elements of the alkaline earth group, followed by dissolution of the precipitate in ammoniacal EDTA solution and the separation of barium and strontium stepwise as sulphates from homogeneous solution with magnesium sulphate and zinc sulphate respectively. A new confirmatory test for barium in the presence of sulphate using rhodizonic acid has also been developed. The method is simple and direct and is fairly rapid and accurate.

New Traffic Circulation System in Connaught Place Area : CRRI Evolves Pattern

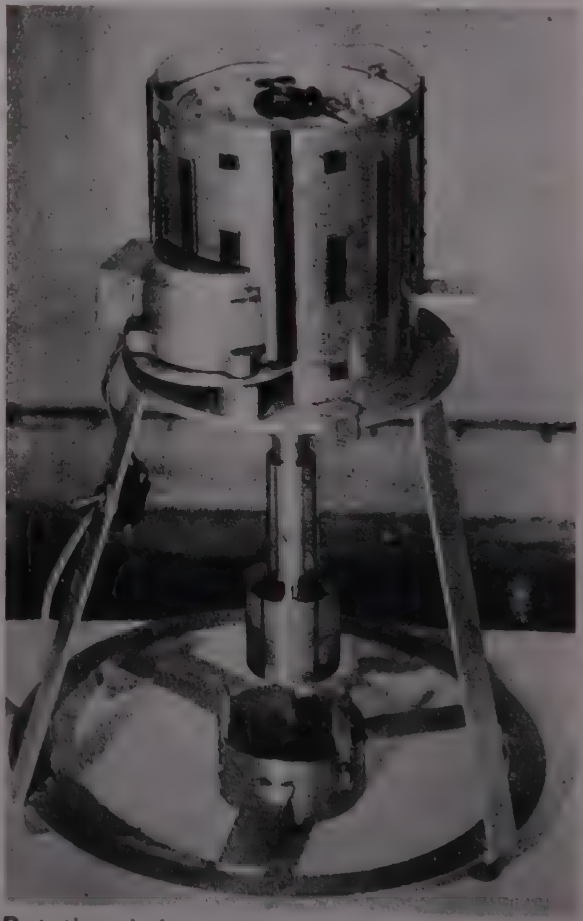
Traffic congestion in the Connaught Place area (New Delhi) has been on the increase during the last few years, making it extremely difficult for the authorities concerned to ensure efficient and safe flow of traffic. The heavy right-turning movements at all the major intersections of Connaught Circus and inadequate in-built safety facilities for pedestrians and cyclists had been posing serious problems. With a view to evolving a suitable and efficient traffic circulation system, the Central Road Research Institute (CRRI), New Delhi, carried out, at the request of the Delhi Administration and the Planning Commission, a study on the traffic pattern of Connaught Place area.

Some of the salient features of the new circulation system evolved by CRRI are : (i) a system of one-way street to divert the through traffic on to the outer circle; (ii) signalization of all the intersections in the outer circle and synchronization of these signals so as to ensure a continuous green wave for the traffic; (iii) separate signals for cycle traffic, which have been introduced for the first time in the country; (iv) overhead signals for better visibility and advance guidance to traffic; (v) three aspects of signals for each direction of traffic; (vi) different timings of signals for different periods of the day in consonance with traffic requirements; (vii) reflective road signs; (viii) suitable channelizing islands at all the intersections for guiding and controlling traffic movements, besides serving as refuge islands for pedestrians; (ix) pedestrian safety measures such as separate signal aspects for pedestrians, zebra crossings and railing barriers; (x) segregation of cycle traffic; and (xi) improved geometric elements.

A comparison of road accident figures after improvement of traffic circulation and signalization in Connaught Place area, i.e. during the period August-November 1974, with the average figures for the corresponding months in the years 1971, 1972 and 1973 shows that there was a phenomenal decrease in road accidents after the new pattern was introduced : the decrease was 100% in fatal accidents, 31% in injury accidents, 43·4% in property damage accidents, and 40% in the total number of accidents.

IIP Develops Rotational Slurry Viscometer

A rotational slurry viscometer which gives viscosity of oils, lubricants and slurries instantaneously has been developed by Jasbir Singh and D.L. Kapoor



Rotational slurry viscometer developed at IIP, Dehra Dun of the Indian Institute of Petroleum (IIP), Dehra Dun. Simple in operation, compact in size and robust in design, the instrument is portable and suitable for laboratory as well as field applications. It has two speeds with two ranges : (i) 60 to 600 cp ± 3 cp; and (ii) 500 to 1600 cp ± 5 cp.

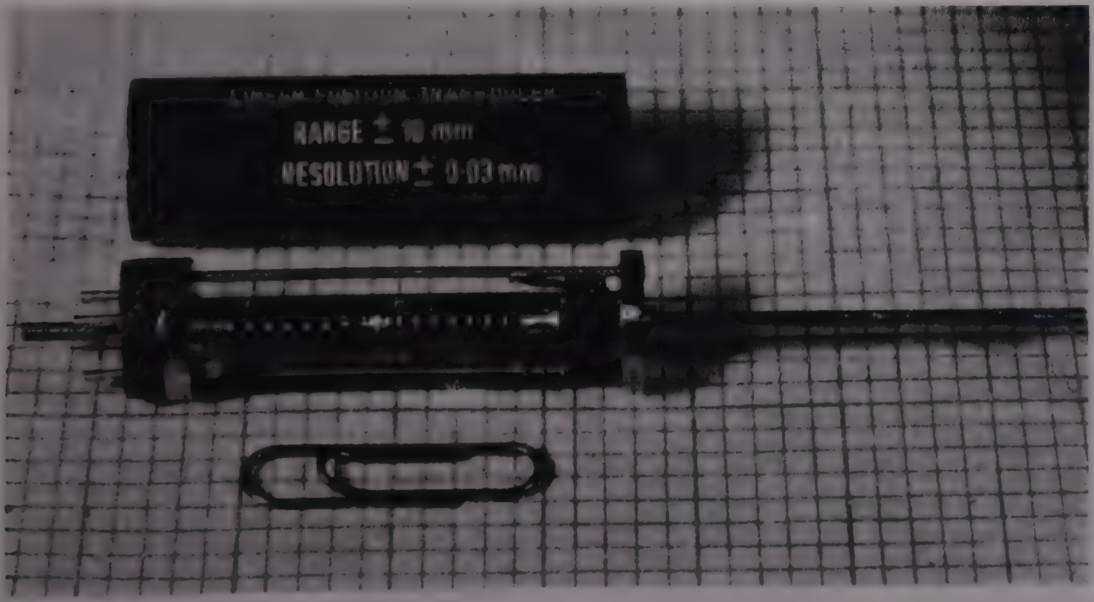
The viscometer is suitable for reading viscosity at room temperature directly (scale calibrated in centipoises), and is provided with an in-built facility to convert viscosity readings in electrical signal for remote panel indication/control. It operates on ac mains, 220-250V, 50Hz.

Linear Position Transducer

A linear position transducer for a displacement range of 0-20 mm has been developed by the National Aeronautical Laboratory (NAL), Bangalore. A precision wire-wound potentiometer, developed specially for this purpose, is used as the basic sensor. A spring-loaded plunger is provided for mechanical coupling. The transducer does not require an amplifier; being a potentiometric type, it provides output directly in volts level during operation. The output can be directly fed for panel indication, servo control or telemetering purposes. Because of its high voltage outputs, high resolution, large displacement range and small size, the transducer finds wide application in most of the scientific and industrial large-displacement measurements. At present, two prototype units are undergoing on-board proving tests for airborne applications.

Specifications of the transducer are :

Displacement range : 0-20 mm
Resolution : ±0·03 mm
Linearity : ±0·15% FSD
Input resistance : 10 k-ohms (nominal)
Max. operating voltage : 30 V ac/dc
Temp. coeff. of res. : 3 ppm
Operating temp. : −55°C to +125°C
Dimensions : length, 50 mm; diam, 12·5 mm
Weight : 45 g

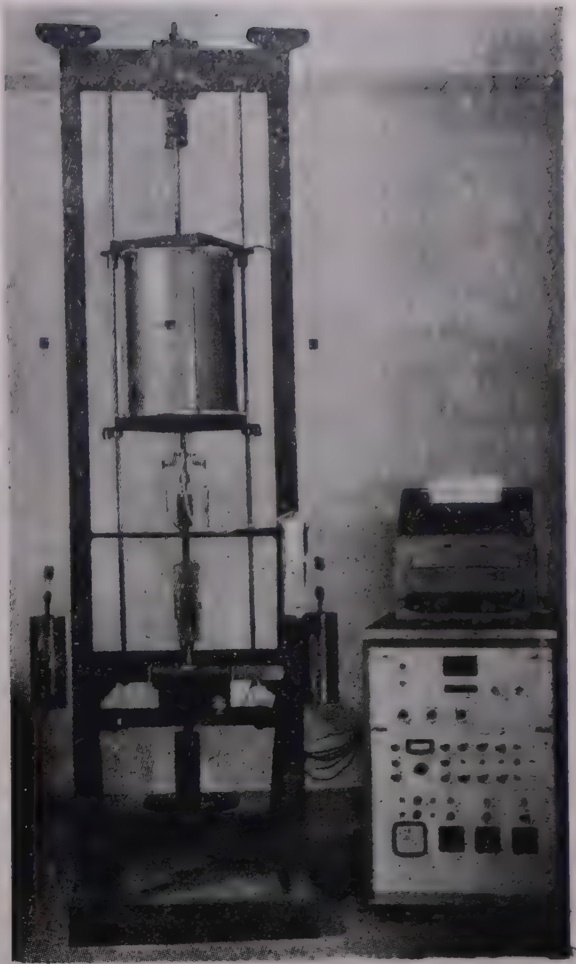


Linear position transducer developed at NAL, Bangalore

Instrumentation and Control Systems for Creep Testing Machine

An instrumentation and data logging system for the measurement of extension and temperature in a high-temperature creep testing machine (3-tonne) has been developed by the National Aeronautical Laboratory (NAL), Bangalore. The instrumentation system consists of two LVDT type extensometers with associated signal conditioners, three high-temperature thermocouple sensors with low-drift instrumentation amplifiers and a high-stability reference temperature oven. The outputs of the extensometer and the thermocouple amplifiers are sequentially scanned by a digital data logging system and the data printed out on a teleprinter. An electronic programmer is incorporated to initiate the measurement cycle and the print-out operation, at a preset programmable time interval. The specimen, whose creep data are required, is subjected to the desired temperature by means of a three-zone high-temperature furnace. The furnace temperature is controlled with a fully solid-state proportional controller. The temperature on the full test length of the specimen inside the furnace is maintained within ±0·5°C up to 800°C.

The design of the data logging system is such that data from several creep testing machines can be logged by the same system by making a few modifications at a later date.



Instrumentation and control systems for creep testing machine developed at NAL, Bangalore

Magnetizer

An impulse type magnetizer has been designed and developed by the National Aeronautical Laboratory (NAL), Ban-

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galore, for the Electronics Corporation of India Ltd (ECIL), Hyderabad. The magnetizing coil of this unit is specially designed to suit rectangular type waveguide magnets of the type specified by ECIL. The unit employs the principle of capacitor discharge to obtain high instantaneous currents and has the facility to charge the capacitor after each discharge. The unit consumes approximately 30 W of power at normal mains voltage. The unit was supplied at a cost of Rs 17,000.

Specifications of the magnetizer are: number of poles, 2; magnetizing current, 1000 A to 350 V dc; duration of pulse, 2 milli-seconds; and repetition rate, 1/2 min.

NCL R & D Briefs

Acrylates

The National Chemical Laboratory (NCL), Poona, has worked out processes for manufacturing octyl and butyl acrylates for the Indian Petrochemicals Corporation Ltd (IPCL), Baroda, on sponsored basis. The corporation has been provided with the complete process design on the above technologies. The laboratory is assisting IPCL in the selection of a process and working out of process design parameters for the manufacture of methyl acrylate. The firm has obtained basic information on the manufacturing process from a Japanese firm.

1-Naphthaleneacetic Acid

A project on the development of know-how for 1-naphthaleneacetic acid, sponsored by Micro Chemicals (India), Mandsaur, has been completed by NCL. The process was worked out on 1·25 kg/batch scale. 1-Naphthaleneacetic acid is a plant growth hormone used in the cultivation of apple, pineapple and rubber crops.

Phenthoate Plant

A plant for the manufacture of phenthoate, based on NCL technology, has been commissioned by Bharat Pulverising Mills Ltd, Bombay. The capacity of the plant is 300 tonnes/annum and the annual turnover at full capacity production would be worth about Rs 22 million. Phenthoate is an important broad-spectrum organo-phosphorus insecticide.

Chloromethanes Plant

Based on the successful collaborative operation of a semi-commercial plant for the chlorination of methanes, Standard Alkali, Bombay, have recently commissioned a full-scale commercial plant of 3000 tonnes/annum capacity of chloromethanes (predominantly carbon tetrachloride and chloroform). The value of annual production of this plant at rated capacity is expected to be around Rs 20 million. The plant uses byproduct methane from the National Organic Chemicals Industries Ltd which was otherwise being wasted.

Toluidines Plant

Based on the sponsored work done in NCL, Sudarshan Chemicals Pvt. Ltd are installing a plant for the production of toluidines at Roha, Dist. Kolaba. At full capacity the value of production of toluidines in this plant would be Rs 50 lakh per annum.

Progress Reports

IIEM Annual Report : 1973

The Indian Institute of Experimental Medicine (IIEM), Calcutta, has brought out its annual report for the year 1973. The 63-page (royal 8vo) report shows that the institute continued to lay emphasis on projects having immediate relevance to biological industries. Thirteen projects in all were investigated; work on two projects, viz. (i) production of penicillinase, and (ii) isolation of plasma protein fractions, was completed. The projects investigated under the purview of the coordination council for biological sciences were: (i) scaling up of the production of fungal protease, and evaluation of its use in leather bating; (ii) follow-up chemical investigations of Indian medicinal plants identified in the preliminary screening programme at the Central Drug Research Institute, Lucknow, and the Regional Research Laboratory, Jammu; (iii) experimental cultivation of *Dioscorea* yams of high diosgenin content; and (iv) utilization of slaughter house products. The total financial inputs during the year amounted to Rs 29·478 lakh.

The production of acid protease from *Penicillium janthinellum* by the process developed earlier was scaled up to 10 kg per batch using the facilities at the Central Leather Research Institute (CLRI), Madras. The product was tested at the CLRI tannery as well as at a commercial tannery in Calcutta and found satisfactory for use as an acid bate. It was about four times as active as imported bates, while the cost of production was about 54% of the cost of imported product.

Under the project on bacterial recombinants for use in immunoprophylaxis in medicine, plasmid-mediated gene transfer was found to be a widely prevalent gene transfer process occurring at high frequencies. Plasmid-mediated gene transfer involving different markers was achieved across taxonomic barriers, e.g. between Vibrio and Staphylococcus.

The work on monoamine metabolism was re-oriented with emphasis on metabolic processes that may underlie the phenomenon of drug addiction. Accordingly, the effect of chronic amphetamine administration on rat brain amphetamine dehydrogenase activity was investigated. On administration of the drug in suitable doses for a month, brain tissue was observed to exhibit a small but significant rise in dehydrogenase activity.

A process for the production of penicillinase has been developed. The process is based on adsorption of a *Bacillus licheniformis* culture supernatant on alumina followed by chromatography on carboxymethyl cellulose and precipitation with ammonium sulphate;

it yields 100 mg penicillinase, of specific activity 3,00,000, per litre of culture fluid.

The contents of histones and acidic proteins in rat, guinea pig and rabbit brain were determined, and considerable species differences shown to exist. Interspecific differences were demonstrated in the composition of brain nuclear histones, particularly in respect of the cysteine-containing F_3 component.

The enzyme hyaluronidase was prepared from ovine testes on a laboratory scale. The process is now being scaled up by the Biochemicals Unit of CSIR at Delhi.

Follow-up chemical investigations on medicinal plants with confirmed biological activity were in progress. The plants studied during the year included *Solanum seaforthianum* and *Maesa chisea*.

A method for the preparation of 3-keto, 28-aldehydes from the corresponding dihydroxy pentacyclic triterpenes was evolved. A mixture of three alkaloids was isolated from the leaves of *Caesalpinia digyna*; the plant is useful in the treatment of phthisis, scrofula and diabetes.

The estimation of the diosgenin content of *Dioscorea prazeri* specimens from various sources was undertaken. The specimens cultivated in the Coorg farm and received from the Central Indian Medicinal Plants Organisation, Lucknow, contained 3% diosgenin. A specimen of the same species received from Kalimpong (Darjeeling) contained 1·8% diosgenin.

A double precipitation method for isolating bovine albumin was developed. The product compared favourably with the commercial sample.

Drugs inhibiting acetyl choline synthesis have been shown to afford significant protection against experimental Parkinsonism caused by Parkinsonimimetic agents. A causal relationship was established between the neuromuscular and Parkinsonimimetic effects in the mechanism of action of oxytremorine.

A project on toxaemias of pregnancy was taken up in collaboration with the Department of Obstetrics and Gynaecology of the Calcutta Medical College.

Twenty-seven research papers were published by IIEM during the year.

CSIR Support To Research

New Schemes

Studies in Alicyclic Compounds

Alicyclic compounds have often provided the critical molecular framework necessary to test the theories of organic structures and reactions. Among alicyclic compounds the fused-ring systems are of interest because of the special features involved in their formation. The study of reactions of the fused-ring systems, specially at bridge-head, have provided tests for investigation of carbonium ion, carbanion and free radical theories. In a new CSIR research scheme granted to Dr R. Ramamohana Rao (principal investigator), Department of Chemistry, Visva-Bharati, Santiniketan, it is proposed to study the formation of fused-ring systems of bicyclo [*n*.3.0] alkanes and related tricyclo derivatives and their heterocyclic analogues. Special attention will be given to the synthesis of bicyclo [3.3.0] alkanes with bridge-head groups and related tricyclo derivatives. The study of reactions occurring at the bridge-head of these fused-ring systems will be investigated to gather information about the configuration of intermediates against the background of theoretical expectations. The study of bridge-head reactions would provide a new and important tool for examining reaction mechanisms and would yield information about the preferred geometries of transition states. A series of compounds with bridge-head polycyclic systems will be synthesized, and these will be ideal substrates for testing purposes, which in turn may explain the potential significance of the study of reactions occurring at the bridge-head of the bicyclic and tricyclic systems.

It is also proposed to study the Koch-Haaf carboxylation reaction (preparative and otherwise) of secondary and tertiary alcohols. This will be an interesting application of the Koch-Haaf reaction pertaining to alicyclic compounds in general and the fused-ring systems in particular. There has been a great deal of interest during the past decade in the Koch-Haaf carboxylation reaction involving direct carboxylation of carbonium ions. Since many carbonium ions can be readily generated by the reaction of alcohols (or alkenes) with strong acids, the process of elimination and carboxylation can be conveniently carried out in a single step. The biological activity of these compounds will also be studied.

Completed Schemes

Studies on Ribosomes of Developing Chick Embryo

Ribosomes are the structures on which translation of the genetic message takes place. It is now becoming increasingly clear that they are not merely passive structures that act as platform for the production of proteins but are active in the synthesis as well as the control of protein synthesis. In a CSIR research scheme, a study of chick embryo ribosomes was undertaken with a view to finding their possible role in the control of protein synthesis and consequently in development. The studies were made by Mrs Uma V. Rao, a CSIR research fellow, at the Department of Biochemistry, Indian Institute of Science, Bangalore.

Changes, if any, of the content of ribosomes with development were investigated. Fertilized eggs from a pure strain of White Leghorn hens were incubated at 37°-38°C with adequate humidity and the rRNA from the whole embryos at various stages of development was isolated by extraction with phenol at *p*H 4·5. Phenol and other low molecular weight ultraviolet absorbing materials were removed by repeated precipitation with ethanol. Under the conditions of isolation contamination by DNA was negligible. The isolated RNA was gel-filtered on a Sephadex G-200 column to separate the high molecular weight RNA from tRNA. The optical density eluting in the high molecular weight region was taken as ribosomal RNA. The amount of rRNA estimated by this method was comparable to that determind by chromatography on MAK columns.

It was observed that the rRNA content per gram of tissue remains constant up to the 10th day of incubation, then it increases and reaches maximum on the 16th day when it is 75% to 100% more than that on the 10th day. This pattern of change in rRNA is similar to that for tRNA content observed by other workers in this laboratory. The protein content of chick embryo per gram of tissue has been found by other workers to be approximately two-fold higher from 12th to 17th day than that at other stages. Therefore, the increase in the rRNA content, and consequently the ribosomes, apparently is for increased protein synthesis during the period. The base composition of rRNA of the embryo at various stages of development was almost identical.

A study was then carried out on the protein-synthesizing ability of polysomes and ribosomes isolated from the livers of embryos and adults at different stages of development. Embryo-liver polysomes were found to have approximately three times more amino acid incorporation activity than that from 8-week old adult-liver. Polysomes isolated from 15- and 18-day-old embryo livers had more or less the same polymerizing activity. However, when polymerizing factors were interchanged, activity decreased in both cases, suggesting specificity.

Similarly, ribosomes from embryo-liver were found to have 3 to 5 times more activity for polyuridylic acid-direc ed polyphenylalanine synthesis, compared to the adult-liver ribosomes. Interchange of pH 5 enzyme and supernatant factors resulted in a marked change in activity, again suggesting specificity for factors and ribosomes from the same stage of development.

The protein content of the ribosomes from embryo-liver was much higher than that in adult-liver ribosomes. The protein/RNA ratios for embryo and adult ribosomes were 1·2 and 0·89 respectively. Recentrifugation of the ribosomes in 0·5M ammonium chloride did not alter the protein/RNA ratio nor the activity.

The differences in the protein content of the ribosomes from the two stages suggested differences in the structural organization of the ribosomes. In order to get an insight into differences in the structure, the susceptibility of ribosomes to ribonuclease T_1 was studied. Ribosomes were pretreated with urea, then incubated with ribonuclease T_1 and gel-filtered on a Sephadex G-200 column to separate the released oligonucleotides. These oligonucleotides were digested with alkali and analyzed for their base composition. It was found that the base composition of the oligonucleotides released from embryo ribosomes was different from that for adult ribosomes.

The studies have thus shown that during development of chick embryo changes in protein content of ribosomes take place, resulting in differences in the structural organization and biological activity. These findings support the view that ribosomes provide important control functions in protein synthesis and consequently in various metabolic functions of the cell.

Report on Areas of R & D in Fifth Plan Programmes of Gujarat

The Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, has brought out this report with the object of identifying areas where R & D efforts have a role to play in the Fifth Plan programmes of Gujarat. Documents of this type would be useful in establishing active links between the state governments and the CSIR laboratories and other R & D organizations in the country and would accelerate the implementation of the programmes of the Fifth Five-Year Plan.

The report (mimeographed) contains four chapters, the introductory chapter describing the status of Gujarat in the economic field. The Fifth Plan programmes of the state are outlined in the second chapter. The third chapter deals with the programmes listed under the industrial sector; and the possibilities of strengthening the general programmes with support from R & D agencies are indicated in the fourth chapter.

The report also gives information on the areas identified for foreign collaboration, the activities of the state corporations, industrial development areas and schemes floated by the Department of Industry for helping industrial enterprises in the state in their initial as well as day-to-day operations.

Gas Adsorption Method for the Surface Area of Cement and Related Materials

This is a special publication (SP-8) of the Cement Research Institute of India (CRI), New Delhi, issued in January 1975. It gives a comprehensive account of the gas adsorption technique for finding the true surface area of cement and related materials. The gas adsorption technique for finding the true surface area of any powdered material, due to Brunauer, Emmett and Teller (BET), can determine all the surface areas including irregularities of the order of molecular dimension. The theoretical background of the method, construction of apparatus and its operation and computations of surface area from adsorption data are described in the publication. Also included are CRI-determined BET surface areas of selected samples, viz. clay, limestone, portland cement, natural gypsum, fly ash and hydrated cement paste.

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Seminar on Low-cost Housing and Fire Research

Shri P. N. Haksar, Deputy Chairman, Planning Commission, took over as Vice President, CSIR, on 10 March 1975.

An international seminar on Low-cost Housing and Fire Research was organized by the Central Building Research Institute (CBRI), Roorkee, for the Association for Science Cooperation in Asia (ASCA), at the India International Centre, New Delhi, on 3-4 March 1975. Delegates from Australia, Japan, Thailand, Singapore, Indonesia, Philippines and Sri Lanka, besides India, took part in the seminar. An upshot of the recommendation of the Third Meeting of ASCA (New Delhi, April 1974), the seminar was meant to pool the experiences of these countries and to recognize the areas of collaborative work.

Inaugurating the seminar, Shri T.A. Pai, Minister for Industry and Civil Supplies, stressed the importance of low-cost housing and fire research against the background of acute housing shortage and colossal loss of life and property resulting from fires. Praising the efforts made by CBRI, the National Buildings Organisation (NBO) and the Structural Engineering Research Centre (SERC) towards reducing the cost of building construction, Shri Pai expressed the hope that further collaborative efforts amongst the member countries of ASCA would go a long way in solving the problem of housing and in reducing fire hazards. He called upon the experts assembled to find solutions to these problems through the application of modern science and technology.

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, while welcoming the delegates, referred to the techniques of low-cost housing developed by CBRI. A large number of primary school buildings in rural areas had been constructed using these techniques which have resulted in reducing the cost considerably. Well-proven techniques could be utilized in the low-cost housing project on a large scale, he added.

ASCA
CSIR
SEMINAR ON LOW COST HOUSING & ON FIRE RESEA
3-4 MARCH 1975

Prof. Dinesh Mohan, Director, CBRI, addressing the seminar. Seated (from left)—Shri K. N. Johry, Prof. Y. Nayudamma, Shri T. A. Pai and Shri P. L. De

Technical sessions of the seminar on Low-cost Housing and Fire Research were presided over by Mr R. K. Hill and Mr G. M. Miskin, both from Australia, respectively. Fourteen papers were presented in the session on Low-cost Housing and nine in the session on Fire Research. The presentation of papers in each session was followed by discussions which focussed attention on areas for collaborative R & D work for the solution of various problems of housing and fire.

In their paper, J. K. Sridhar Rao and A. K. Gupta (NCST, New Delhi) mentioned that the gap that existed between research and practice in the area of low-cost housing had led to needless wastage of scarce materials resources, which developing countries could ill-afford. The authors held the view that extension of research should

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be given greater priority than R & D itself, especially in the area of low-cost housing. Emphasis was laid on the need for full utilization of the available materials resources and facilities (hardware) through the use of high-level design concepts (software).

Although bamboo, timber, straw, reeds and mud are traditional materials of construction in Bangla Desh, their maintenance costs—because of heavy rainfall, frequent storms, insects, fires, etc.—are rather high and thus they cannot be considered as economical materials. Moreover, even bamboo and timber are becoming scarce for building construction because (i) the population pressure has brought most of the land into agriculture, and (ii) paper mills have started consuming a lot of these materials. Against this background, S. J. Ahmed and M. Easin of Bangla Desh CSIR discussed the development of soil-lime building blocks as an alternative to the traditional materials.

Production of low-cost industrialized wooden houses as a promising opportunity for forest-based industry of Philippines was the subject of a paper presented by J. O. Siopongco from that country; the paper also reported work under way on the development of saw-dust cement hollow blocks.

S. K. Misra of CBRI described a number of construction systems and individual components of building which had found application in the field of low-cost housing with varying degrees of success.

J. B. Beesley (Australia) stressed the need for evolution and development of the 'early fire hazard test' and described how it could be employed to study early burning properties of timbers; the benefits accruing from fire-retardant treatment of timbers were also dealt with.

Gypsum boards with additives such as expanded perlite, expanded vermiculite, asbestos fibre, paper pulp and glass fibre appear to possess very attractive fire behaviour and resistance properties. M. J. Ridge (Australia) outlined the studies made at the Division of Building Research of CSIRO on developing such fire-resistant boards.

A state-of-the-art review on fire research and testing activity in India was presented by G. N. Badami of CBRI.

A detailed account of the research work being carried out in Philippines to combat fire hazards was given by R. F. Casin. Relative flammability of various species of wood, and fire-retardant treatment of wood are some of the problems being tackled. Basic research on pyrolysis and combustion of wood, development of standard test equipment and development of improved fire-retardant treatments for wood and wood-based materials figured in the future plan of study.

Recommendations

Presented below is a brief account of the recommendations made at the two sessions :

(1) Efforts should be made to make optimum use of manpower and materials in low-cost housing by adopting long-term housing policies and by developing more efficient techniques of construction for higher productivity, and labour-intensive, energy-saving and resource-conserving methods.

(2) Common standards, test methods, procedures and test materials should be evolved. Where ISO standards are available, these may be considered for adoption.

(3) Effective institutional mechanisms should be developed with a view to encouraging more investment in the production of building materials.

(4) Planning and building regulations and bylaws should be framed taking into account changing socio-economic and technological realities.

(5) Government construction departments should accept promising innovations for a certain amount of pilot constructions and provide feedback information to research establishments.

(6) There should be exchange of programmes and research reports in the areas of low-cost housing, building materials and fire research. Exchange of visits by scientists was also considered necessary.

(7) Materials specifications, test specimens, etc. should be exchanged.

(8) Building regulations bearing specific reference to fire safety and fire protection should be exchanged.

Nine projects in low-cost housing and 11 projects in fire research were identified for collaboration between three or more of the participating countries. Some of the projects identified for collaboration are: Planning and design of mass housing for low-income groups; development of cellular concrete and expanded clay aggregates for building low-cost houses; upgrading of building materials and construction techniques for rural houses; development of building materials from agricultural, industrial, mining and city wastes; improvement in manufacture of lime; economic methods of sewage disposal; fire-resistance testing; control over fire, smoke and toxic gas hazards and simulation of large-scale fire behaviour by small-scale tests; fire detection and automatic extinguishment; fire safety in petroleum industry; development of protective gear (fire suits), breathing apparatus, helmets, etc.

Indian Roads Congress Medal for CRRI Scientist

A technical paper entitled 'Investigations for the strengthening of the main runway of a civil airport' by Dr M. P. Dhir of the Central Road Research Institute (CRRI), New Delhi, and Shri P. S. Sandhawalia of the Central Public Works Department (CPWD) has been awarded the Indian Roads Congress medal. The paper was published in *J. Indian Rds Congr.* [**34**(4) (1972), 721].

Reported in the paper is the investigation carried out by CRRI at the instance of CPWD for strengthening and improving the pavement of the main runway of an international airport in the country, by establishing the structural capacity available in different reaches and arriving at measures for upgrading the pavement to the level of 'LCN 100'. Originally, the

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20 MAY 1975

runway was heterogeneous, with three types of pavement structure, viz. a single layer of concrete, two layers of concrete, and two layers of concrete with bituminous overlays. A higher structural capacity was required in consideration of the air traffic already operating as well as of anticipated traffic (Jumbo jets).

The institute made a study of the runway by direct road tests and reverse design approach. The results of the study were supplemented with indications available from the condition and performance of the pavement under the traffic prevailing then. The overall results were seen to be quite satisfactory and in general conformity.

The Automotive Research Association of India

The Automotive Research Association of India (ARAI) is a cooperative research association affiliated to the Council of Scientific & Industrial Research. It is the youngest industrial research association set up by the automobile and ancillary industries in cooperation with CSIR and the Department of Heavy Industries (Ministry of Industry & Civil Supplies). ARAI will receive UNDP assistance in setting up an automotive test centre for components and ancillaries.

ARAI is managed by a governing council consisting of 25 members, headed by a President. Three of the members are nominated by CSIR. A high-level technical committee advises ARAI in its programmes of testing and research.

The personnel of ARAI at present include, besides the Director (Dr B. S. V. Rao), a Project Officer, and Development & Test Engineers. The Test Engineers have been specially trained in R & D activities in selected factories of the members of ARAI.

The long-term objective of ARAI is to set up an Automotive Research Centre to test components, accessories and motor vehicles, and assist the Indian automobile industry in the design and development of new products to suit operating conditions obtaining in India. It is also proposed to set up facilities for applied and pure research in automobile engineering.

ARAI is located at Poona; 261 acres of land have been acquired on a long lease from the Poona Municipal Corporation. The research centre has its site on the plateau in Kothrud hills in Poona City. The building, under construction, is expected to be ready soon; it consists of a workshop of about 1100 m² (33 m × 33 m) area.

The ARAI project is planned in three phases. The first phase will be completed in 1975-76 with a capital outlay of Rs 3 million. During this phase, test facilities for automotive components, mainly manufactured in the small/medium-scale sectors, will be set up. The second phase, which will be implemented in 1976 and 1977, will entail a capital investment of Rs 12 million. In this phase, ARAI will receive UNDP assistance in setting up sophisticated facilities for testing engines, transmission, steering, hydraulic and electrical components and assemblies. In the third phase, higher investments would be necessary for the setting up sophisticated facilities for testing complete vehicles ranging from mopeds to heavy-duty trucks. This would include torture test tracks, proving grounds and also the laboratory and testing equipment for applied and basic research in the automotive engineering.

ARAI has already taken up a number of programmes. Several surveys of automotive ancillary industries in the various regions of the country have been conducted. The research and development needs of the industrial units, particularly in the small-scale sector, have been assessed. Several projects have been identified in order to assist these units in the design and development of products. The projects which have been identified will be undertaken immediately by ARAI. A project under way is aimed at assisting the small-scale unit near Poona in designing, and testing and developing a fibreglass side-car for scooters. Another project to be taken up shortly concerns the development of air-cleaners by another small-scale manufacturer in the same area. The activities of ARAI will be extended to cover the needs of the industry in all the regions of the country.

Reduction of Sodium Hydrosulphite Consumption in Vat Dyeing of Textiles

NRDC's Award-winning Process from BTRA

In textile industry, dyeing of cotton cloth with vat dyes is quite common because of their superiority in all-round fastness properties. Normally, these dyes are water-insoluble and therefore cannot be applied to cotton goods directly. In the presence of alkali and a suitable reducing agent, they get converted to the leuco form and enter the fibre where they are reformed by subsequent oxidation; hence their fastness properties. The reducing agent generally used is sodium hydrosulphite and a large amount of this chemical is consumed in dyeings with vat colours. In practice, a given lot (length of the fabric) takes appreciable time for dyeing, and during this time, the atmospheric oxygen as well as the oxygen dissolved in water adversely affects its reducing power. To offset this effect, a large excess of hydrosulphite is initially added to the dye bath or the feeder tank. An electrolytic process developed jointly by Prof. E. H. Daruwalla of the Department of Chemical Technology, University of Bombay, and Shri S. D. Supanekar of the Bombay Textile Research Association, Bombay, reduces substantially the excessive consumption of hydrosulphite in vat dyeing of textiles.

The process consists in the electrolysis of the dye bath solution by immersing in the latter a specially designed electrode system. This system maximizes the cathode area where cathodic reduction of sodium hydrosulphite to another species in the dye bath takes place. Simultaneously, the anode, where oxygen is liberated, is either positioned or enclosed suitably to minimize its adverse effect. The reducing species present in the hydrosulphite solution through which the passage of electric current takes place is far more energetic than the ordinary one and, as a result, there is saving of the chemical.

The raw materials required for fabricating the electrodes are readily available, and the electrodes can be fabricated in any workshop with minimum facilities. The power required for electrolysis can be tapped from a 230V, 50 Hz supply, or any normally available source. Usually, a current of about 15 amp at a voltage of 10-30 V (dc) is required.

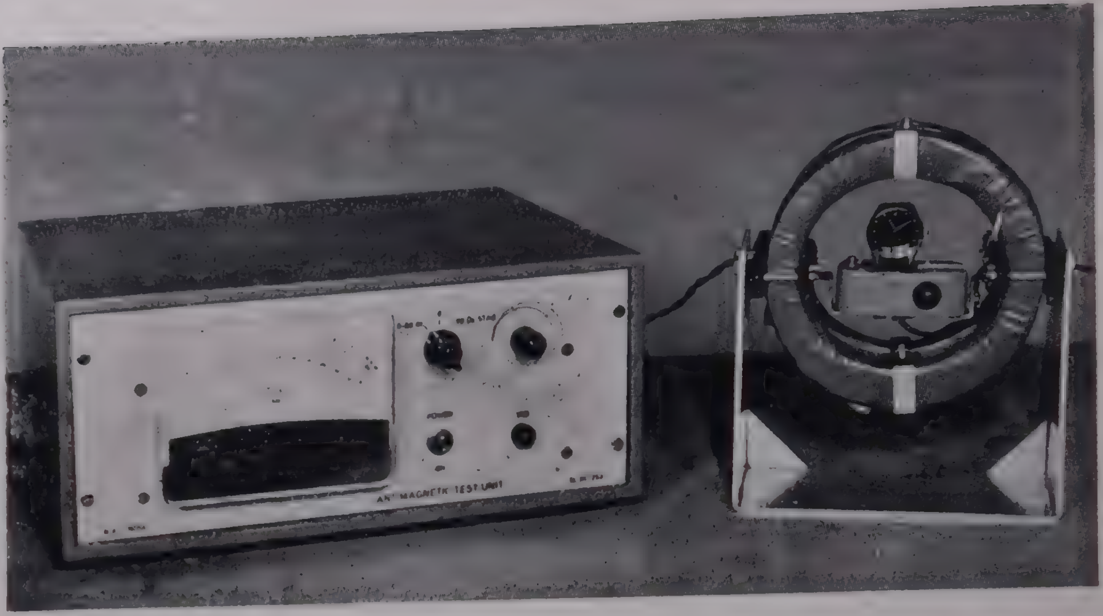
The process is applicable to all cases of vat dyeing of textile materials, and substantial savings (up to 40 %) in the consumption of sodium hydrosulphite are effected. Once fabricated, the equipment can be used for a long time; it is safe to operate and requires no additional manpower or specialized skills.

The cost of the equipment at the current price level is estimated at about Rs 7000. The running costs are negligible. In terms of the payback period it has been estimated that for a unit running for three shifts, it is about 10 weeks for jiggers and about one week for the continuous plant.

A special feature of this process is that the left-over solution (to be drained) contains lesser quantities of chemicals than the conventional process, resulting in reduced pollution and healthier environments. The gases evolved during the electrolysis are neither toxic nor noxious.

The process is entirely novel and offers extensive scope for exploitation in India and abroad. Some twenty mills are already utilizing the process.

Prof. Daruwalla and Shri Supanekar were jointly awarded a cash prize of Rs 5000 for their invention by the National Research Development Corporation of India (in January 1975).


Antimagnetic test unit for wrist watches : NAL, Bangalore

NAL Develops Antimagnetic Test Unit for Wrist Watches

The National Aeronautical Laboratory (NAL), Bangalore, has designed and developed an antimagnetic test unit for testing wrist watches. To be used at the HMT Watch Factory, the unit is capable of producing a continuously variable magnetic field from 0 to 100 oersteds. There is provision also to establish a stabilized field of 60 oersteds. The watch to be tested is kept in this field for a known duration and subsequently checked for time (seconds) lost per day due to the field exposure. The project was sponsored by HMT Watch Factory, and the unit is at present working satisfactorily at the factory.

BITM's Science Camp

The Birla Industrial & Technological Museum (BITM), Calcutta, organized a science camp for students from the states of West Bengal, Orissa, Assam and Tripura from 20 to 28 February 1975. The camp was intended to develop creative abilities among students, especially from rural areas. The programme included mainly two activities, viz. training-cum-project work and students' science exhibition. The training-cum-project work covered disciplines like physics, chemistry, biology, electronics and astronomy. More than 400 models, exhibits, kits and instruments relating to various disciplines of science, engineering and technology, made by students from different schools, were displayed at the exhibition. A number of selected models from five regional science fairs organized by BITM at Purulia, Contai, Malda, Burdwan and Jalpaiguri from 6 to 10 February 1975 were also displayed.

Two seminars, one each on (i) visual aids in primary science teaching, and (ii) work experience and science education, were organized for teachers.

In all, 44 prizes and five scholarships, including three CSIR scholarships, were awarded to winners.

Effect of Fibre Friction on Yarn Properties and Processing Performance of Cotton and Man-Made Fibres

The effect of fibre friction on the quality of yarns has been studied by Shri V. Subramaniam (CSIR research fellow) at the South India Textile Research Association (SITRA), Coimbatore. Investigations were also undertaken to study the physical significance of friction to yarn processing and the relationship between fibre properties and friction and comparison between different measurements of friction. Fibre friction measurements were made using an instrument based on fringe method and developed at SITRA. Also, an instrument based on Capstan method for measuring single fibre friction against various surfaces was designed and fabricated.

The results showed that friction in cottons was significantly correlated with other fibre properties, viz. fibre length, fineness and bundle strength. Friction was found to influence the amount of waste produced in carding and the physical properties of fibre assemblies, viz. strength, minimum twist of cohesion and uniformity. Spinning factors like twist for maximum strength and optimum cradle opening during spinning were also found to be related to fibre friction.

The last stage of spinning, where the fibre ribbon emerges from the delivery rollers for twisting, was found to be the best stage for applying frictionizers to fibres. This has been found to result in considerable increase in yarn strength (100 to 200%) even at low-twist multipliers without any significant increase in yarn irregularity. Decrease in the yarn uniformity while processing fibres having high friction was found to offset the advantages of applying frictionizers during spinning.

Breeding and Maintenance of Laboratory Animals : Group Discussion at IIEM

At a group discussion on breeding and maintenance of laboratory animals held on 14 March 1975 at the Indian Institute of Experimental Medicine (IIEM), Calcutta, the participants stressed the importance of obtaining experimental animals from standard animal houses, the need for maintaining cleanliness in animal houses, and the ill-effects of food deficient in proteins and vitamins on the animals reared on such food. The discussion was held under the joint auspices of IIEM and the eastern regional unit of the Indian National Science Academy.

Prof. R. N. Chakravarti, Director, IIEM, gave an account of the development of the animal house at IIEM. He stated that in the last quarter of this century enormous developments would take place in the biological field and that laboratory animals would play a very important role. As animals received from private suppliers were often undernourished, diseased and even used in experiments in other laboratories, it was essential to procure them from standard animal houses in order to get reliable results. The Director also stressed the importance of cleanliness. With proper air-flow system provided in the animal house, chances of the spread of air-borne infections would be minimized and the place would be free from the usual animal house odour. He referred to the various improvements made in the IIEM's animal house as a result of which the laboratory was no longer getting its supplies of such animals from outside, and that, in fact, the surplus was being sold to other research laboratories.

One of the participants, Dr S. K. Bhattacharya of the Chittaranjan National Cancer Research Centre, Calcutta, laid stress on the importance of cleanliness, food, bedding, temperature and humidity control, available space, fresh air and light for breeding mice. Cannibalism might result from poor living conditions, starvation, lack of water, fear, irritation, discomfort, noise, improper handling, dietary deficiencies or lactational failure.

Prof. K. Haldar of the All India Institute of Hygiene and Public Health, Calcutta, observed that protein deficiency leads to certain ill-effects in the laboratory animals, as, for example, the testes of immature rats becoming more sensitive to protein deficiency than those of mature rats, a protein-free diet preventing sexual maturation, protein deprivation leading to fetal resorption, and a low-protein diet delaying ovarian response to gonadotrophins. Vitamin A depletion in female rats results in fetal loss and congenital malformations. Deficiencies of folic acid, pyridoxine, pantothenic acid, riboflavin and biotin produce varying degrees of fetal loss. Spermatogenesis is seriously affected in vitamin E deficiency.

Presenting accounts of inbred strain and random-bred strain, Dr H. G. Sen (Ciba Research Centre, Bombay) observed that breeding pairs (also harem) should be selected from the second litter. Prof. P. N. Khanna of the All India Institute of Hygiene and Public Health, Calcutta, stated that difficulties often arose because of varying responses of individual animals either due to genetic or environmental variables. The genetic variation could be eliminated with inbred strain, while environmental interference could be controlled through gnotobiology, using germ-free animals.

Dr Arabinda Basu of IIEM presented an account of the common arthropod parasites of laboratory animals and their control. Discussions revealed that though for gnotobiology sterilization of food and bedding is essential, for production of laboratory animals used for research it may not be so very essential to sterilize food and bedding, although cleanliness should be maintained as far as possible. Use of clean paper for bedding of rats and mice was stated to be useful. Summing up the discussion, Dr D. P. Sadhu of Bengal Veterinary College, Calcutta, referred to the ill-effects of stress, e.g. stranger effect, overcrowding, strong light/irregular lighting period, high-pitch sound, unfavourable temperature and humidity, uncleaned bedding, and improper handling on breeding and maintenance of laboratory animals.

CIMPO Report : 1965-73

The Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, has brought out a report containing information on medicinal and aromatic plants developed by this laboratory during 1965-73. The 295-page report (royal 8vo) also outlines the objects of the organization, its scope and functions.

A number of new plants have been introduced by CIMPO; they include *Mentha arvensis*, *M. citrata*, *M. piperita*, Citronella (Java), palmarosa, geranium, French basil, belladonna and ergot. The laboratory has developed methods of cultivation of these plants and extraction of active principles from them. Superior strains have been evolved of (i) Citronella (Java) having oil with 96% total alcohols (calculated as geraniol) and 47% aldehyde content, (ii) lemongrass with 90% citral content in its oil, and (iii) palmarosa with oil having 94% geraniol content. Researches at CIMPO and its regional centres have led to the production of : bolder crystals of menthol, liquid menthol from dementholized oil, berberine hydrochloride, linalool and linalyl acetate from *Mentha citrata* oil; and geraniol and citronellal from Citronella (Java) oil.

Medicinal and aromatic plant products worth about Rs 51 lakh are produced every year in CIMPO farms and factories. Also, CIMPO's efforts have enabled the country to produce about 200 tonnes of mentha oil valued at about Rs 60 million, 300 tonnes of citronella oil worth about Rs 25 million and other items worth about Rs 20 million. CIMPO's farms located in Jammu & Kashmir produced 12·5 tonnes of ergot during 1973-74, sufficient to meet the entire annual demand of the country.

The organization has helped a large number of private and public parties (2343) in developing medicinal and aromatic plant industry by supplying plant materials and information. Information useful to growers and other parties interested in the development of medicinal and aromatic plant industry has been given in an appendix.

One hundred and fifty-five papers were published, or presented at conferences, during the period covered in the report.

Hydrogenation of Cottonseed Oil : Project Report

Investigations on hydrogenation of cottonseed oil to obtain new and improved edible fat products were made under a PL-480 project at the Regional Research Laboratory (RRL), Hyderabad. It is desirable in the hydrogenation process to reduce the linoleoyl group with minimum formation of *trans* isomers and without much saturation of oleate. A variety of approaches to this end were made using nickel, copper and cobalt catalysts.

The formation of *trans* isomer in the hydrogenation of cottonseed oil was considerably low when silver stearate additive with Rufert nickel catalyst was employed. The *trans* isomer lowering effect was not observed during methyl linoleate hydrogenation. This might be due to prevention of original monoene in cottonseed oil from isomerization.

Copper as a catalyst was found to be selective in the hydrogenation process. The *trans* isomer formation was faster in the case of cobalt catalysts than with nickel catalysts.

The effect of pressure on hydrogenation process was also studied. An increase in pressure resulted in a decrease in the formation of *trans* isomers when nickel was used as a catalyst, while the reverse was true for copper.

The results of these studies are embodied in a technical report on the project published (1974) by RRL, Hyderabad.

Progress Reports

CRRI Annual Report : 1973-74

The annual report of the Central Road Research Institute (CRRI), New Delhi, for 1973-74 records the progress of R & D work under the following subdisciplines ; Soils; Flexible pavements; Rigid pavements; Roads; Traffic engineering, economics and statistics; Extension; and Bridges. The 140-page report shows that the institute paid considerable attention to consultancy assignments involving predominantly field investigations. A major consultancy project completed by CRRI was the technical appraisal of the rural roads constructed all over India.

The institute investigated a large number of landslide and related hillside slope stability problems with a view to recommending corrective and preventive measures, on behalf of certain organizations. As an active participant in the Committee of Experts constituted by the Border Roads Organization to arrive at a possible solution of the stabilization of Nashri landslide in Jammu & Kashmir, the institute prepared a detailed report embodying specific recommendations. Landslides along Jowai-Badarpur Road, which forms an important link for the hill states of Meghalaya, Tripura, Manipur and Assam, and landslides on North Sikkim Highway were investigated. Investigations were also conducted on hill-slope stability for the foundation of the structures of a microwave antenna complex in the Himalayan region.

A simple vibratory T-iron device for making dummy contraction joints in concrete pavements has been developed. Full-scale semi-field trials have shown that the device takes only 15 to 20 sec to penetrate into the green concrete as against 5 to 10 min required with the conventional T-section. The joints formed with the new device were clean and smooth and required no finishing.

The Karimnagar district development project of CSIR, in which CRRI is coordinating, registered further progress and reached the threshold of implementation phase. Investigations were carried out by CRRI on seven priority roads, as identified by the district administration, totalling to a length of about 56 km. These are, by and large, approach and link roads which would be catering to limited traffic only.

Based on the study of field conditions, materials surveys and testing, the institute recommended economical specifications to yield appropriate serviceability levels.

A technical appraisal of rural roads, constructed under the crash scheme for rural employment of the Department of Community Development of the Union Ministry of Agriculture, was carried out by CRRI. The institute made suggestions and recommendations to the Ministry for improving the durability and performance characteristics of the roads. The recommendations broadly cover planning and phasing of development projects, construction aspects of roads, technical quality control and supervision, and maintenance aspects.

Neoprene bearings are being used increasingly in newly constructed bridges because of their economy and ease in construction, maintenance and replacement. But neoprene used in bearings has a tendency to crystallize at low temperatures and become stiff and brittle. A stiffness testing equipment, based on the determination of flexural stiffness, for neoprene has been developed at the institute.

With a view to studying the characteristics of traffic and transportation problems of tourist cities, a case study was taken up in Simla at the instance of the National Committee on Science and Technology, the Planning Commission and the Government of Himachal Pradesh. Traffic surveys were conducted in the town and extensive data were collected on goods transportation demand and possibilities of improvement of the Cart Road which circumscribes Simla and is the main arterial road available for vehicular traffic and caters to the demand of both passenger and the goods traffic. The data collected were being analyzed in order to make suitable recommendations.

The institute has planned and initiated an integral study of highway design and road transport economics in India: financial and technical participation is expected from the International Bank of Reconstruction and Development, Canadian International Development Agency and Ministry of Shipping and Transport (Roads Wing), Government of India.

Some of the other important projects of consultancy work handled by CRRI relate to : strengthening and resurfacing of some New Delhi Municipal Committee roads; design of cement concrete pavement for the Delhi Transport Corporation; improvement of some sections of Sonamarg-Kargil-Leh Road, and investigation of a bridge in Mizoram.

CSIR Support To Research

New Schemes

Biocidal Activity of New Organometallic Diorganodithiocarbamates

Moieties of the type R_3Sn and R_2M (where R is aryl group and M is Ga, In or Tl) have been reported to possess high antimicrobial activity against *Colletotrichum falcatum*, *Sclerotium rolfsii* and *Gloeocercospora sorghi* which cause various diseases in sugar crops (sugarcane, sugarbeet, and sweet sorghum). Fungi toxicities of diorganodithiocarbamates of various transition metals have been investigated by a number of workers and some of these carbamates have been shown to be commercially useful.

In a new CSIR research scheme granted to him, Dr T. N. Srivastava of the Department of Chemistry, Lucknow University, Lucknow, proposes to synthesize a number of new organometallic diorganodithiocarbamates through several routes. These compounds will be characterized by physicochemical methods. An attempt will be made to correlate the biocidal activity of these compounds with their structures. These studies are expected to yield information on the mode of action of these compounds.

Nonlinear Problems in Displacement Processes

The object of a new CSIR research scheme granted to Dr A. P. Verma (principal investigator) and Shri Manoj N. Mehta (CSIR research fellow) at the Department of Applied Mathematics, S. V. Regional College of Engineering and Technology, Surat, is to make a theoretical study of nonlinear problems in displacement processes involving two immiscible fluids through underground porous media, viz. secondary recovery processes in petroleum technology. Singular perturbation methods will be employed to consider singularities in the differential system. The study is likely to throw light on phenomena like imbibition and instabilities in double-phase flow through porous media, besides improving analytical methods for such investigations.

PATENTS ACCEPTED

Indian Pat. 135734

A process for the production of kerosene and diesel oil from heavy stocks of petroleum, such as vacuum distillates and residues, employing a specially prepared alumina base catalyst

B. B. Brahmachari, M. R. Saha, A. N. Bose, S. B. Basu, B. Chatterjee, A. K. Ganguli, V. A. Krishna Murthy, A. N. Basu, N. G. Basak & A. Lahiri

Central Fuel Research Institute, Dhanbad

The invention covered by the patent relates to the production of kerosene and diesel oil by hydrocracking heavy stocks of petroleum, such as vacuum distillates and residues, which are currently being used as fuel.

In the field of petroleum refining some processes are known for the production of naphtha, kerosene and diesel oil by way of hydrocracking. The catalysts employed in such processes are very expensive, since the base materials on which the active hydrogenating components are deposited are very sophisticated materials like molecular sieves/zeolites. These are not being manufactured in the country.

The process developed at CFRI employs a less expensive catalyst prepared with indigenous materials. The process adopted for the preparation of the catalyst, particularly the technique of precipitation and pretreatment of the base, is very simple and is quite different from the hitherto known processes. The new technique imparts to the catalyst a special property which is required for higher selectivity and for obtaining products of superior quality.

Experiments on the production of kerosene and diesel oil were carried out in a tilting-type autoclave of 1·2 litres capacity. Later, the results of autoclave experiments were confirmed in a bench-scale continuous-flow vapour-phase reactor of 250 ml catalyst volume capacity. The reaction temperature was maintained between 350° and 480°C and the pressure and residence time were kept at 40-150 kg/cm^2 and 20-200 min respectively. The reaction product was filtered and distilled under reduced pressure to obtain three fractions, viz. naphtha, kerosene and diesel oil.

The total conversion of feed obtained in a single-pass run to products boiling below 350°C was nearly 95% by weight. The maximum yield of kerosene and diesel oil obtained in once-through basis, however, was 55% by weight, which was raised to 78-80% by weight (85% by volume) on recycling the product boiling above 350°C, keeping the production of hydrocarbon gases below 5% by weight.

The qualities of kerosene and diesel fractions were assessed in accordance with the standard method of analysis; both these fractions conformed to the IS specifications for quality-grade kerosene and diesel oil.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 2/75

It is proposed to appoint a Scientist F (Deputy Director) for the Central Building Research Institute, Roorkee.

Job requirements : Should conduct and organize research in a field connected with buildings and help in evaluation of research programmes in the laboratory as well as development and pilot projects, and transfer of techniques from the laboratory to industry and the field.

Qualifications : High academic qualifications in civil engineering and considerable research experience in civil engineering or allied fields. Scientists and technologists with high academic qualifications in other branches of science who have worked in subjects related to building construction and building materials industry will also be considered. Proven ability of guiding research and research management, experience of planning and execution of development and engineering projects desirable.

Salary/Conditions of Service : The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merits. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proforma must be received in this office on or before 4 June 1975.

Advertisement No. 3/75

It is proposed to appoint a Scientist F (Deputy Director) for the National Metallurgical Laboratory, Jamshedpur.

Job Requirements : Should conduct and organize research in the field of hydro-, pyro- and electro-metallurgy involving the establishment of a large-scale testing facilities complex, covering planning of plant and buildings layout, drawing up of equipment specifications, design of specialized process plants, management and coordination; help in evaluation of research programmes in the laboratory as well as developmental and pilot plant projects, and transfer of techniques from the laboratory to industry and the field.

Qualifications : High academic qualifications in metallurgical or chemical engineering and considerable research experience in metallurgical/chemical engineering or allied fields. Scientists and technologists with high academic qualifications in other branches of science who have worked in subjects related to metallurgical/chemical industry will also be considered. Proven ability of guiding research and research management, experience of planning and execution of developmental and engineering projects desirable. Persons having long experience in management and project coordination with a flair for process design will be given preference.

Salary/Conditions of Service : The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merits. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

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Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

Interim enquiries will not be attended to.

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CSIR NEWS

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NCL Develops Process for Manufacture of Nitrile Rubber

The National Chemical Laboratory (NCL), Poona, has developed a process for the manufacture of nitrile rubbers from indigenous materials. Nitrile rubbers are an important class of oil-resistant rubbers and are imported to the extent of 800 tonnes/annum, valued at Rs 16 million. Production of styrene-butadiene rubber, the only synthetic rubber being manufactured in the country, is based on imported technology. The major raw materials required in the NCL process are butadiene, already being manufactured in the country, and acrylonitrile, which will be available from Indian Petrochemicals Corporation Ltd, Baroda, in the next 2-3 years.

Nitrile rubbers are compatible with natural rubbers, SBR, PF resins, PVC, etc. Blends of nitrile rubber and PVC are especially important and can replace neoprene rubbers in several applications. Nitrile rubbers are used in oil, gasoline and solvent hoses, gaskets, oil seals, adhesives, shoe-soles, brake-linings, cable sheathings, chemical plant linings, printing rollers, etc.

Synthetic rubbers are manufactured to stringent specifications with regard to their composition, Mooney plasticity, permissible non-rubber constituents, storage stability, processing and physical properties. NCL has developed the know-how for the manufacture of high, medium and low nitrile content rubbers with acrylonitrile contents of 42, 34 and 25% respectively. The rubbers obtained in the process developed at NCL are comparable to equivalent imported rubbers in their processing, physical, solvent-resistant and other properties. Linear reaction rates and hence better process control, homogeneous chemical compositions and improved storage stability are the special features of the NCL process.

Pilot plant for production of nitrile rubber at Synthetics & Chemicals Ltd, Bareilly

Synthetics and Chemicals Ltd, Bombay, evinced keen interest in the project and collaborated in market surveys and evaluation of the rubbers. The nitrile rubber of medium grade produced at the pilot plant erected by this firm at Bareilly conformed in quality with imported samples and was well received by the users. The NCL process has been released through the National Research Development Corporation of India to Synthetics and Chemicals Ltd, who have been licensed to manufacture 2000 tonnes of nitrile rubber per annum.

The country would be able to save annually Rs 40 million in foreign exchange as a result of production of these rubbers indigenously. Specialized expertise in the fields of emulsion polymerization, copolymerization, reaction control, latex and rubber technology acquired during the course of these investigations will be of use in the research and development work on other industrial polymers.

SITRA's Thirteenth Technological Conference

The thirteenth technological conference of the South India Textile Research Association (SITRA), Coimbatore, was held on 29 March 1975. The conference was inaugurated by Shri K. Rajaram, Minister for Labour, Government of Tamil Nadu, and presided over by Shri G. V. Doraiswamy, Chairman, Council of Administration, SITRA. Eight papers dealing with various aspects of textile technology were presented.

In his inaugural address, Shri Rajaram referred to the objectives of SITRA, viz. helping member mills to produce more cloth at cheaper rates and to improve the efficiency of worker. Earlier, in his welcome address, Shri K. Sreenivasan, Director of SITRA, said that in spite of the difficult period through which the textile industry was passing it was gratifying to note that 19 units had become members of SITRA—a record increase in membership in a year since the formation of SITRA. A number of agreements had been entered into for the transfer of technical know-how. One agreement was in regard to increasing the wear life of industrial fabrics and another was in respect of the process of coating spindle tapes for increasing their wear life. Use of spun yarns for warp knitting, inter-firm comparison studies, and instrumentation were some of the other areas in which the Association was carrying out research work. With the financial assistance from the Southern India Millowners' Association, SITRA could set up two powerloom service centres—one at Somanur and the other at Komarapalayam in Salem District. Financial assistance from the Gwalior Rayon Ltd would be utilized to run powerloom service centres in those areas in the south where synthetic yarn was being used. It would also enable SITRA to extend these services to other areas of the decentralized sector such as the knitting industry and the handloom industry in future, the Director said.

Shri C. V. Doraiswamy enumerated in his presidential address the various problems faced by the textile industry. He also referred to the steps taken for the establishment of a National Service Centre for Knitting Industry in SITRA with UNDP assistance. This would eventually be a training centre for the entire South East Asia region.

A brief account of the papers presented at the conference is given below.

The results of a study concerned with the replacement cost of machines were presented by T. V. Ratnam. Mathematical formulae relating to the determination of capital charges, etc. for replacing machines were covered in the paper.

A. R. Kalyanaraman, in his paper, discussed a chemical method to increase the wear life of cellulosic material and its application to spindle tapes. It has been found possible to increase the life of spindle tapes by 2 to 3 times by a coating of cellulosic material on them.

In a paper dealing with the techno-economic feasibility of using spun yarns for warp knitting, K. P. R. Pillay had worked out the economics of warp knitting as compared to weaving and the conditions under which investments on warp knitting would be worthwhile. He had also worked out the relationship between yarn properties and machine speeds on the one hand and knitting properties and fabric properties on the other.

(Miss) Indira Doraiswamy presented an account of the studies made in an inter-laboratory project (of ATIRA, BTRA and SITRA) relating to the cost and consumption of various categories of stores items in spinning and weaving in 160 member mills. The price-life relationship of various stores items were dealt with, and norms for various stores accessories were suggested.

The performances of indigenous card clothing were compared with those of imported clothing, in a study conducted by R. Sripathi. The results indicated that indigenous wires compared favourably with imported ones in many of the profile characteristics.

In the paper entitled 'Invisible loss in sizing', K. S. Shankaranarayana stated that the dead loss in sizing ranged from about 6 to 50%. The investigation showed that the size input could almost completely be explained when proper corrections were applied. Some suggestions which would enable more accurate accounting of size inputs in a mill were made.

The shortcomings of the wrapping procedures followed by 35 member mills of SITRA were discussed and suggestions for improvements were given by K. Govindarajulu. A ready-reckoner for working out the tolerances and the suggested frequency of wrappings in the various departments were given.

Research and Industry Get-together at CFRI

A brief account of the sessions devoted to mining in the get-together between research and industry organized jointly by the Central Mining Research Station and the Central Fuel Research Institute (CFRI), Dhanbad, has been published [*CSIR News*, **25**(1975), 50]. The proceedings of the sessions devoted to coal research and coal utilization are summarized here. The sessions were held at CFRI, and 14 key papers were presented in the following fields : (i) Resource quality assessment and coal preparation, (ii) Direct use of coal, (iii) Conversion of coal to other products, and (iv) Product improvement and valorization of by-products of coal industry. Seven papers from CFRI presented a global review of the technology with critical assessment of CFRI's contribution and the rest of the papers, from various industrial organizations, focussed attention on the current practice adopted by the Indian industry and problems it faces. A number of problems were identified as a result of discussions that followed each session and recommendations were made towards the solution of these problems

Resource quality assessment and coal preparation

A comprehensive picture of the reserves, availability and quality of coals and lignites occurring in India was presented by A. K. Moitra of CFRI. While presenting an account of quality assessment work done by CFRI, Moitra said that the coal survey organizations should be geared to meet the future heavy demands of coal of the order of 200 million tonnes/annum.

N. Sen of the Central Mine Planning and Design Institute, Ranchi, made suggestions for devising a suitable method for the determination of physical properties of coals.

G. G. Sarkar (CFRI) said that a substantial portion (46-90%) of run-of-mine coal was subjected to washing treatment in most of the coal-producing countries. The bulk of the run-of-mine production is suitably processed to produce marketable coal, resulting in the elimination of rejects. But in India, only 1·2% of such coal is treated and the rest is sold as such. It was recommended that free dirt or non-coaly matter be removed from the salable production.

Representing CCWO, D. K. Basu stressed the importance of reducing moisture content in the clean coal. Moisture could be reduced by thermal or mechanical means, and Basu referred to CFRI's oleoflotation process for this purpose.

Some of the important recommendations made at this session are as follows :

(1) The utilization potential of coking blends of Pundi coal (West Bokaro coalfield) should be re-examined by CFRI. A method should be evolved to forecast caking propensity, avoiding tests on bulk sample.

(2) Technical audit of all the central washeries could be done jointly by CFRI and industry.

(3) Incorporation of oleoflotation technique might be done in the proposed Patherdih pilot washery to prove its efficacy for commercial application.

(4) Utilization of washery rejects for thermal drying of washed products, including slurry, by the application of fluid-bed combustion technique should be evaluated.

(5) In view of the high ash content of raw feed to coal washeries, an industrial study on the pattern of production and distribution of coals and their impact on the design of washeries and quality of washed products may be carried out in collaboration with the coal-producing and coal washery organizations.

(6) Technical and economic feasibility of deshaling non-coking coals in jig washers for power generation should be evaluated, besides the methodology for quality control of power-station coals.

Direct use of coal

S. K. Das Gupta of CFRI highlighted the salient features of the institute's contributions in the fuel development activities of the country with special reference to the expertise developed on coal combustion. He said that the institute had entered into a collaborative project with the Bharat Heavy Electricals Ltd and CMERI on the industrial use of fluid-bed combustion boilers.

Ram Prasad (Bharat Heavy Electricals Ltd) said that under the present conditions of energy crisis, coal had become a major source of energy and that the coal reserves must be utilized judiciously. Techniques should be developed for large-scale production of liquid and gaseous fuels from solid fuels to meet the demands of process and domestic sectors. Fluid-bed combustion techniques should be suitably developed for the utilization of slack coal. Future lines of R & D work suggested were : extensive development of coal gasification system; use of gasified coal for MHD and replacement of fuel oil in power stations by coal gas; and use of slack coal and inferior-grade coal by more efficient fluid-bed system.

Ramanuj Rai (Damodar Valley Corporation) dealt with the problems faced by the Corporation in operating thermal power plants using coal of inferior quality, and suggested remedial measures.

The discussions at this session pointed to the need for (i) collaboration between CFRI and boiler designers for developing efficient design for combustion of coal of ash content higher than 30%; (ii) development of techniques for minimizing the gap between the quality assessed in borehole coal cores and that in actual production—work to be done by CFRI in collaboration with coal-producing organizations; and (iii) collaboration of CFRI with the Technical Wing of the Coal Mines Authority Ltd in re-vitalizing fuel efficiency studies.

Conversion of coal to other products

A review of the advances in high-temperature carbonization practice was presented by N. G. Banerji of CFRI. The institute's contributions were discussed and the scope for further coordinated work between research and industry was emphasized.

A. K. Mukherjee (Tata Iron & Steel Co. Ltd) focussed attention on the problems affecting the smooth functioning of the integrated coke oven plants in India. He also dealt with the factors influencing the economy of the carbonization process. It was suggested that CFRI should develop some novel methods for recovering tar acids and tar bases from coal tar and ammoniacal liquor.

V. A. Krishnamurthy (CFRI) reviewed the work on conversion of coal to oils and chemicals with special reference to (i) hydrogenation of coal, (ii) solvent extraction of coal, (iii) hydrogenation of coal tar, and (iv) Fischer-Tropsch process. The merits and demerits of the various processes and their suitabilities under Indian conditions were discussed.

The results of basic research and pilot plant studies undertaken by CFRI on the gasification characteristics of Indian coals were presented by S. K. Das Gupta of CFRI. It was pointed out that all the well-established processes for conversion of coal to hydrogen, synthesis gas or town gas use oxygen, and hence the cost of gas goes up. Use of oxygen should, therefore, be eliminated and air-steam gasification should be tried as it might provide the cheapest route for conversion of coal to gas.

D. G. Rao (Fertilizer Corporation of India Ltd) presented an account of the various gasification techniques and evaluated the comparative merits and demerits of three processes, viz. Lurgi pressure gasifier, Winkler-type fluidized-bed gasifier and Kopper Totget entrained dust gasifier.

Problems suggested for further study included : (i) development of methods for utilizing non-coking coals, particularly slack coals, for the production of smokeless fuel; and (ii) standardization of the quality of blast furnace coke and development of correlation between ash content of coke and blast furnace performance. Collaboration between CFRI and TISCO was suggested in regard to the preheating of coal charge for coking.

Product improvement and valorization

A critical review of the trends and techniques of production of chemicals from byproducts of coal carbonization was presented by C.S.B. Nair of CFRI. Other areas covered were the production of industrial products from coal, active carbons, carbon artefacts and industrial carbons. The characteristics of all byproducts were outlined and the possibilities of production of many chemicals from coal tar, liquor, benzole and gas were evaluated. The work of CFRI in these directions and the future programme of work were discussed.

S. K. Mitra (Durgapur Steel Ltd) outlined the possibilities for growth and development of chemical industries based on coke oven byproducts. He suggested that the Asansol-Durgapur area, where three coke ovens are functioning, could be an ideal site to put up a large central plant for processing the byproducts to more useful products.

One of the recommendations made at this session was that processes which should be flexible enough to use either petrochemical or coal tar based raw materials should be chosen. It was also recommended that technology and engineering of molten salt bath for heating and cooling should be developed.

Recent Researches on History of Science & Technology in India : Seminar at BITM

The Birla Industrial & Technological Museum (BITM), Calcutta, organized a seminar on 'Recent Researches on History of Science & Technology in India' in collaboration with the Indian Association for the Cultivation of Science (IACS). Forty-four specialists participated in the seminar.

In his welcome address, Shri A. Bose, Director of CSIR Museums, stressed the role of museums in interpreting the cultural history of mankind. He said that India had been adopting Western technology since the 18th century and that there was considerable scope for carrying out investigations on how Western technology had been adopted in India and how it had given birth to indigenous science and technology.

Prof. Melvin Kranzberg of Georgia Institute of Technology and Editor-in-Chief of *Technology and Culture* outlined the usefulness of the study on the history of science and technology. He said that every developing country should adopt Western technology to develop appropriate technology suited to its own resources, indigenous capability and need. "Science and technology do not follow a linear cause-and-effect relationship but assume a far more complex form, involving many facets of the society". Prof. Kranzberg discussed the weakness of the unidirectional views that technology is solely dependent on science or that science is the outcome of practice. He called for cooperation and interdependence between the East and the West at all levels of human culture.

Dr S. K. Ghose of BITM gave a review of the research work being conducted by the CSIR museums on five projects : (i) introduction and development of the electric telegraph in India; (ii) Indo-European telegraph; (iii) early electric power generation and distribution in India; and (iv) early history of printing technology in India.

Dr D. Basu, Director, IACS, referred to the role of this institution in furthering scientific research and popularization of science among the masses. The activities of the National Commission, set up by the Indian National Science Academy (INSA), for the compilation of the history of sciences in India were dealt with by Shri S. N. Sen (IACS).

Dr Mamta Choudhury (INSA) spoke on 'glass in ancient and medieval India'. A short report of *Rasarnavakalpa*, a part of tantric text *Rudrayamala* dealing with alchemical recipes and mercurial preparations, was presented by Dr Mira Roy of INSA.

Dr Visvapriya Mukherjee of IIT, Kharagpur, presented a review of the meson theory of nuclear forces.

Shri Pankaj Dutta (Victoria Memorial, Calcutta) read a report on war rockets and match locks used during the Mughal period.

The formation of the 'Indian Association for the History of Philosophy of Science' was announced at the seminar.

CMERI Scientist's Paper Wins Gold Medal

Shri Apurba Kumar Bandyopadhyay of the Central Mechanical Engineering Research Institute (CMERI), Durgapur, has been awarded the Kamala Gupta Charitable Trust gold medal by the Institution of Engineers (India) for his paper entitled 'Design of high-pressure vessel' [*J. Instn Engrs* (*India*), *ST*, **7** (1974) 58]. Shri Bandyopadhyay has been working at CMERI since 1965 in the Product Development and

Industrial Design Division, and is an Associate Member of the Institution of Engineers. He is presently engaged in designing and developing the technology of fabricating multilayered high-pressure vessel, high-pressure autoclave for laboratory use, chlorine container, etc.

Prof. Jena Honoured

Prof. P. K. Jena, Director, Regional Research Laboratory, Bhubaneswar, has been elected a Fellow of the Indian Academy of Sciences in recognition of his valuable contributions in the field of metallurgical research. Prof. Jena has developed a large number of processes on beneficiation of ores and minerals and extraction of metals.

Sintered Photoconductive Cadmium Selenide Cells

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a process for making sintered photoconductive cadmium selenide cells. These cells find extensive use in electronics industries, and are also suitable for special applications for which the ordinary cadmium suphide cells are unsuitable. At present, about 30,000 such cells are required annually in the country, and the demand is likely to increase in future because of the importance given to the development of electronics industries.

In the CECRI process, CdSe is prepared by treating an aqueous solution of cadmium salt with sodium selenosulphate at optimum *p*H, and the CdSe precipitate thus obtained is filtered, washed and dried. Copper and chloride ions are incorporated into this precipitate in required proportion. The product is sensitized to the desired level by firing and the resulting product is sintered. The sintered layers are given suitable ohmic contacts and encapsulated in plastic cases after providing leads.

The cells made by CECRI do not use single crystals of CdSe, as do imported cells, and are comparable with the latter in performance. Since only selenium is to be imported, a considerable amount of foreign exchange required for importing the cells would be saved.

The capital outlay for a plant capable of producing 100 cells per day is estimated at Rs 3 lakh, with the cost of production at Rs 6 per unit.

CMRS Develops Friction-type Barricade Prop

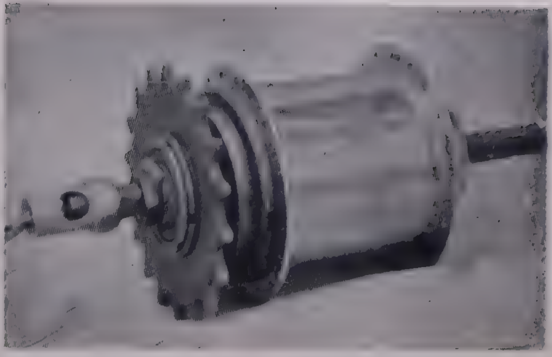
The Central Mining Research Station, Dhanbad, has designed and developed a friction-type prop for use as barricade support during stowing operations in mines. The prop will replace the scarce and costly timber for barricade support in stowed areas. The prop has a capacity of 6-8 tonnes and weighs about 20 kg. The maximum yield is 1·2 m at a height of 3 m. It can be dismantled and shifted easily from place to place, and can be manufactured from indigenously available materials at a reasonable cost.

MERADO Designs 3-Speed Hub for Bicycles

The Mechanical Engineering Research and Development Organisation (MERADO), Ludhiana, has designed a 3-speed bicycle hub. The machinery and raw materials required for the manufacture of the hub are all available indigenously.

The basic design consists of a trigger-controlled epicyclic gear train with output speed ratios as follows : (i) high gear—$33\frac{1}{3}\%$ higher than normal; (ii) normal—1:1 gear; and (iii) low gear—25% lower than normal.

The design has been released on non-exclusive basis to Punjab Agro Industries, Ludhiana, the sponsoring firm, who have gone into commercial production. The firm has an installed capacity for manufacturing 60,000 hubs per year. The cost of finished hub is about Rs 60. The hubs are being exported to USA and European countries.



3-Speed bicycle hub designed and developed by MERADO, Ludhiana

The design can be released to other interested parties also. Further details can be had from : The Scientist-in-charge, MERADO, Gill Road, Ludhiana 141006.

Process for Aniline Sulphate

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a process for preparing aniline sulphate through electrolytic reduction of nitrobenzene in sulphuric acid medium. Aniline sulphate is used in the manufacture of sulphanilic acid and in the rubber, dye and pharmaceutical industries. It has an annual demand of about 6000 tonnes in the country.

The novel features of the CECRI process are that : (i) electrolysis can be carried out with solutions of high ionic strength, (ii) low solubilities of organic materials do not pose problems, and (iii) selectivity of conversion is achieved through the choice of inorganic reactant. The process is free from the disadvantages of the conventional processes. Also, formation of undesirable compounds in the vapour-phase reduction of nitrobenzene does not take place.

The raw materials required are nitrobenzene, sulphuric acid and titanium dioxide. The capital outlay for a plant with a production capacity of 150 kg/day is estimated at about Rs 5·4 lakh, with the cost of production at Rs 18/kg.

Woollen Carding Machine

The Mechanical Engineering Research and Development Organisation (MERADO), Ludhiana, has made many significant contributions in the field of textile machinery, the most important among them being the development of a woollen carding machine.

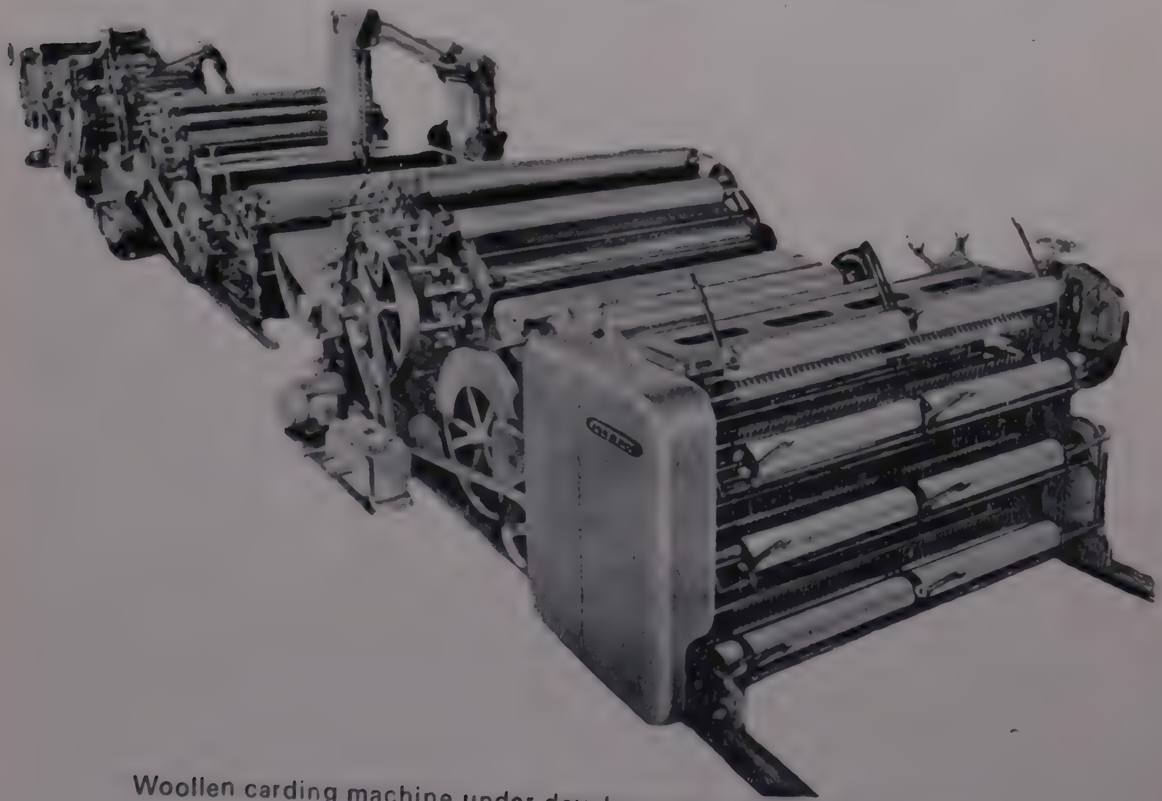
Almost all the major machines used in the shoddy spinning plant for the production of woollen yarns, except the costly woollen carding machine, are being made in India. The design and development of a 3-swift woollen carding machine (size, 2000 mm) was undertaken by the Centre to make possible the manufacture of this machine indigenously.

The MERADO design of the machine includes the following units: (i) hopper feeder; (ii) breast card—850 mm diam. with three worker stripper units; (iii) breaker card—cylinder diam. 1230 mm, five worker stripper units, doffer diam. 1230 mm; (iv) intermediate card—cylinder diam. 1230 mm, five worker stripper units, doffer diam. 1230 mm; (v) Peralta machine—overall loading type; (vi) mixer conveyor units—two, one each between the cards; and (vii) tape condenser—four-stage, four-line system.

The raw materials specified in the design are all indigenous. Standard components and assemblies available in the country have been incorporated to further facilitate the manufacture of the machine. The machine manufactured in accordance with the design of MERADO is expected to have the added advantage of a high production rate with minimum maintenance requirements.

The successful development of the 3-swift woollen carding machine, which used to be imported at a cost of more than Rs 6 lakh in hard currency, is expected to save substantial amounts of foreign exchange.

An interlock knitting machine and a gill box for wool sliver have also been developed by this Centre.



Woollen carding machine under development at MERADO, Ludhiana

Copper Plating on Stainless Steel

Stainless steel utensils are largely used and preferred to copper and brass vessels. But stainless steel is a poor thermal conductor and an appreciable amount of heat is wasted when stainless steel utensils are used. This drawback can be eliminated if the outer surface of the stainless steel vessels is given a copper coating.

A process for direct copper plating on stainless steels has been developed by the Central Electrochemical Research Institute (CECRI), Karaikudi. In the process, copper is directly plated on stainless steel from a strike copper bath followed by copper plating from the conventional acidic copper sulphate bath. Adhesion of the copper coating to the substrate is firm. Direct plating of copper eliminates the necessity of nickel coating between the substrate and the thick copper coating.

Kali Electronics, Kumbakonan, have set up a commercial plant for copper plating by this process with a capacity to plate 7500 cm² per 8-hr shift. The products have been well received in the market.

Studies on Polymerization with Ziegler-Natta Catalyst Systems

Investigations carried out earlier at the National Chemical Laboratory (NCL), Poona, had revealed that the vanadium-based Ziegler-Natta catalysts can be effectively used for polymerization of polar monomers such as methylmethacrylate in non-polar and polar solvents. The kinetics of polymerization with these catalyst systems and the structure of polymethylmethacrylate obtained showed coordinate anionic mechanism in non-polar solvents and free radical mechanism in polar solvents. The activity and stereospecificity of Ziegler-Natta catalyst system is greatly dependent on the valence state of the transition metal in active catalyst complex. The variation of valency of vanadium on mixing with different co-catalysts has been studied to a considerable extent.

Shri V. G. Gandhi (NCL) carried out a systematic study of Ziegler-Natta catalyst systems based on vanadium halides for polymerization of methylmethacrylate to examine the effect of the valence state of vanadium on catalytic activity and selectivity. The studies were carried out under the guidance of Dr S. L. Kapoor.

A comparison of $VOCl_3$-$AlEt_3$ and $VOCl_3$-$AlEt_2Cl$ systems under similar conditions showed that the activity of $VOCl_3$-$AlEt_2Cl$ catalyst system was four times greater than that of $VOCl_3$-$AlEt_3$ catalyst system. This increase in activity was attributed to the increase in the amount of V(III) species in $VOCl_3$-$AlEt_2Cl$ catalyst system. The $VOCl_3$-$AlEt_2Br$ catalyst system (at a higher ratio of Al/V and after 24 hr of aging) having a greater amount of V(II) species in the catalyst complex was found to be less active than $VOCl_3$-$AlEt_2Cl$ catalyst system, which confirmed the average valence state V(III) to be the most active for polymerization of methylmethacrylate in *n*-hexane.

The NMR spectra of all the samples showed stereoblock structure of polymethylmethacrylate, which is independent of the average valence state of vanadium in the active catalyst complex. However, the difference in percentage tacticities led to the conclusion that the active sites containing V(III) complex had preference for syndiotactic polymerization, while V(II) complex had preference for isotactic polymerization. The molecular weights of polymer samples in all cases were found to be in the range of 40,000-80,000, which showed that molecular weights did not change with the change in the average valency of the active catalyst complex.

The studies point to the conclusion that with change in the valence state of vanadium in the active catalyst complex, it is possible to obtain polymethylmethacrylate of desired structure and consequently of desired properties.

Shri Gandhi was awarded Ph.D. degree by the Poona University for his thesis based on these studies.

Detection of Lead and Zinc Toxicity

Lead toxicity due to mining of lead ores, lead smelting and use of lead compounds in other lead-based industries has been reported in the country. Selective decrease in the activity of the enzyme δ-aminolaevulinate dehydratase due to lead poisoning has recently been considered to be a sensitive and specific diagnostic test for detection of lead exposure. Recent work done at the Industrial Toxicology Research Centre (ITRC), Lucknow, has shown that not only lead but zinc inhibits the enzyme. The enzymatic inhibition thus may provide misleading diagnosis. The test is not very selective to lead exposure only, as revealed by studies at ITRC. This observation is of special significance to India as lead and zinc occur together (Zawar mines in Rajasthan). Under the working conditions of simultaneous exposure to lead and zinc, suitable corrections for the effect of zinc are required to be devised. Work on this aspect is in progress at ITRC.

Progress Reports

CBRI Annual Report : 1973

The annual report of the Central Building Research Institute (CBRI), Roorkee, for 1973, published recently, shows that the institute laid greater stress on practical application of research findings of previous years than on taking up new projects. This has resulted in the adoption of various techniques developed by the institute in the building of schools, health centres and low-cost houses. Considerable progress was made with regard to the construction of low-cost houses in rural areas, and in fire research. Several new processes developed at the institute were licensed to the industry. These included : general-purpose and heavy-duty flooring tiles from magnesium oxychloride cement, construction of compaction piles, a new formulation of acid-resistant cement, improved burning of limestones, soil pressure cell, cement paint and high-draught kiln. The R & D efforts of the institute were directed in the following subdisciplines : Building materials; Soil engineering; Efficiency of buildings; Building processes, plant and productivity; Architecture and physical planning; Fire research; and Rural buildings.

At the instance of the Fertilizer Corporation of India, CBRI investigated the suitability of Ramagundam soil for making bricks. The soil was found suitable for making good-quality bricks when 40% fly ash and 0·4% common salt were added.

Good-quality bricks could also be made utilizing alumina red mud, basalt fines and lime sludge. Bricks made from red mud blended with 30-40% alluvial clays showed neither expansion nor efflorescence. For making good-quality building bricks from basalt fines the latter was mixed with black cotton clays and fired at 980°-1000°C. High-strength acid-resistant bricks could also be made from these fines by blending them with plastic black cotton soils and firing the mix at 1050°-1070°C after drying. Lime sludge, a waste material available in huge quantities (about 3 lakh tonnes annually) from sugar, paper and tanning industries in the form of calcium carbonate, could be utilized for making bricks. The institute assisted the Madhya Pradesh Public Works Department in designing a kiln, preparing layout, installation of machinery and actual operation of a plant for producing bricks from black cotton soils by the CBRI process.

A new type of cement called pozzolanic slag cement possessing maximum resistance to sea water was developed by inter-grinding a mixture of cement clinker, granulated blast furnace slag, fly ash and gypsum in suitable proportions to a fineness of 4000 cm^2/g. The cement was recommended for preparing concrete used in marine structures.

The institute undertook studies, sponsored by Indian Oxygen Ltd, Calcutta, and Asiatic Oxygen and Acetylene Ltd, Calcutta, on the development of formulations for masonry cement using carbide lime sludge. The sludge and portland cement were mixed in 55:45 proportion (by weight). The mixture was ground to a fineness of about 5000 cm^2/g, and 0·2% citric acid (by weight of masonry cement) was added to control the setting time. The formulation conformed to the IS specifications for masonry cement.

Pile driving tests were carried out successfully on larger-diameter piles carried down to greater depths. Extensive model tests were carried out on the behaviour of pile foundation under vertical and lateral loads, and designs and technical assistance were provided in the implementation of various projects like road overbridges, microwave antenna tower foundation, and transmission line tower foundations. A new approach to the design of pile caps which is more rational and economical than the conventional design was worked out. Actual field investigations on bored compaction piles, carried out at different places, have shown that the safe loads for these piles were nearly twice as compared to corresponding normal under-reamed piles of the same size. Further investigations were made on the techniques of diaphragm walling and this technique was applied in the construction of R.C.C. cut-off walls in Sarda Sahayak Pariyojana in Uttar Pradesh. It proved to be very economical and speedy, and provided an alternative to driven steel sheet piles in hydraulic structures.

The institute carried out the acoustical designing of the auditorium of the legislative council building at Lucknow. A number of cinema halls, auditoria and theatres were also designed for conferring better acoustics.

In cooperation with the Rajasthan Housing Board, six demonstration houses were built with stone masonry blocks, resulting in savings of 37% in time and 5% in overall cost. Investigations on brick slab with gypsum mortar indicated savings of about 70% in cement and 25% in steel as compared to conventional RC slab.

With a view to reducing cost and consumption of materials, various systems of construction and low-cost houses were evolved.

Research studies were carried out on health buildings, and planning guidelines prepared for the governments of Uttar Pradesh and Karnataka. A large number of such buildings are being constructed in these two states under the World Bank Population Project.

In the field of fire research, a water-repellent fire-retardant paint, developed earlier, was modified to eliminate the costlier constituents. Work on the development of cheap, robust and efficient fire detectors was continued and pneumatic spot type and electronic heat-sensitive detectors were developed. Instruments for testing the surface spread of fire and flammability of thin materials were also developed.

Fifty research papers were published during the year.

Comprehensive Traffic and Transportation Studies of Greater Bangalore : CRRI's Publication

The Central Road Research Institute (CRRI), New Delhi, has published a book embodying the findings of comprehensive traffic and transportation studies of Greater Bangalore made by the institute at the instance of the Department of Town Planning, Government of Karnataka. A report, in fourteen volumes, containing proposals for improving the circulation pattern in Bangalore was prepared by the institute; the present publication is a comprehensive summary of the report.

The methodology to arrive at a solution of the acute traffic and transportation problems and the manner in which the formulation of broad-based proposals were dovetailed to the analytical and factual findings of field surveys are highlighted in the book. An index is also included.

The book (298 pages, demy 4to) is expected to serve as a ready reference for solving the ever-increasing traffic and transportation problems in the other cities of the country. Further enquiries relating to the book may be directed to : The Director, Central Road Research Institute, Delhi-Mathura Road, New Delhi 110020.

S. S. Bhatnagar Prizes : 1972 & 73

Fifteen scientists have been named for the Shanti Swarup Bhatnagar prizes for the years 1972 and 1973. The recipients of the awards in the various subjects are as follows.

Physical Sciences : Prof. S. Chandrasekhar, Liquid Crystal Laboratory, Raman Research Institute, Bangalore, and Prof. S. K. Joshi, Head, Physics Department, Roorkee University, Roorkee (1972); Prof. Virender Singh, Tata Institute of Fundamental Research, Bombay (1973).

Chemical Sciences : Dr S. V. Kessar, Panjab University, Chandigarh, and Dr A. P. B. Sinha, National Chemical Laboratory, Poona (1972); Prof. M.V. George, Indian Institute of Technology, Kanpur, and Dr H. B. Mathur, National Chemical Laboratory, Poona (1973).

Biological Sciences : Dr B. B. Biswas, Bose Institute, Calcutta, and Dr S. C. Maheshwari, Delhi University, Delhi (1972); Prof. S. S. Guraya, Punjab Agricultural University, Ludhiana, and Dr B. R. Murthy, Indian Agricultural Research Institute, New Delhi (1973).

Engineering Sciences : Prof. G. Swarup, Tata Institute of Fundamental Research, Bombay, and Dr R. P. Wadhwa, Bharat Electronics Ltd, Bangalore (1972); Prof. M. M. Sharma, Bombay University, Bombay (1973).

Geological Sciences : Dr K. Naha, Indian Institute of Technology, Kharagpur (1972).

In addition, Prof. M. K. Vainu Bappu, Director, Astrophysical Laboratory, Kodaikanal, has been chosen for 1970 prize in physical sciences.

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CSIR NEWS

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Foundation Day and Research & Industry Get-together : RRL, Bhubaneswar

The Regional Research Laboratory (RRL), Bhubaneswar, celebrated its twelfth foundation day and organized a Research and Industry Get-together on 13 April 1975. The function was inaugurated by Shri K. C. Lenka, Minister of State for Industries, Planning and Coordination, Government of Orissa, and was presided over by Shri V. S. Mathews, Chief Secretary to the Government of Orissa.

In his inaugural address, Shri Lenka urged the laboratory to gear its activities in the fields of minerals, metals and special materials in view of the abundant availability of varied mineral resources in the state. Shri Lenka complimented the laboratory for developing various processes and products, utilizing the natural resources in Orissa, and expressed the hope that the laboratory would make all efforts towards developing non-ferrous minerals and metallurgical industries in the country. He urged the industry to make use of the facilities available at this laboratory.

In his welcome address, Prof. P. K. Jena, the Director, outlined the objectives of the laboratory. It had undertaken applied and industrial research on the utilization of vast and varied mineral, forest, agricultural and marine resources of the region for the development of various industries. He expressed the hope that the laboratory would play a significant role in bringing about rapid industrialization in the region. Some of the projects of national and regional importance that the laboratory had taken up are : reduction of phosphorus content of high-phosphorus manganese ores; production of synthetic rutile and high-purity iron from ilmenite of Orissa, Tamil Nadu and Kerala; beneficiation of low-grade limestone; beneficiation and agglomeration of iron ore fines; utilization of fly ash for manufacture of refractory-grade thermal insulation bricks; high-purity carbon from rice husk and saw dust; high-purity graphite from graphite minerals; preparation of potassium nitrate from potassium chloride; iron oxide pigment from pickle liquor of steel plants; and cottage-scale fish meal plant. During 1974, the laboratory commercialized four of its processes, viz. steam distillation unit for extraction of essential oils; hand-operated bellow pump; earth auger; and methyl anthranilate from phthalic anhydride. Eight processes were referred to the National Research Development Corporation of India during 1974. He welcomed the industrialists and entrepreneurs to expose their technical problems and sponsor projects for ultimate commercialization.

Shri V. S. Mathews, in his presidential address, said that some industries based on the processes and products developed by this laboratory and other CSIR laboratories could come up soon in the state of Orissa. He extended full cooperation from the Government for planning and implementation of R & D projects for the development of industries in the State.

The processes and products developed by this laboratory and other CSIR laboratories and exposed to industrialists and entrepreneurs at the get-together were : synthetic rutile from ilmenite; production of electrolytic iron powder from iron chloride solution; utilization of fly ash in refractory products; beneficiation of low-grade limestone for wet process cement-making; process for the production of sponge iron in a rotary kiln; cottage-scale production of fish meal; digital *p*H meter; thermosilico tester; and process for domestic smokeless solid fuels based on coal/coke breeze.

The laboratory also organized an 'open day' on 14 April 1975, at which the processes and products developed by RRL, Bhubaneswar, the National Metallurgical Laboratory, the Central Scientific Instruments Organisation, and the Central Fuel Research Institute were demonstrated and exhibited.

Technology and Economics of Man-made Textiles in India : Seminar at SASMIRA

The Silk & Art Silk Mills' Research Association (SASMIRA), Bombay, organized a seminar on Technology and Economics of Man-made Textiles in India on 16 April 1975 in New Delhi. The technological gap in the man-made textile industry as between India and the developed countries was reviewed and discussed. The first technical session was devoted to the technological aspects of the man-made textile industry.

Inaugurating the seminar, Shri K. D. Malaviya, Union Minister of Petroleum and Chemicals, called upon the man-made fibre industry to produce textiles for the poorer sections of the society by adopting a dual policy. He emphasized that ways should be found to reduce the cost of production.

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The country could not afford to remain out of the mainstream of progress achieved in the rest of the world and the industry had to play an important role in this regard. The Minister was optimistic regarding the future of the industry and urged the industry to contribute liberally towards the implementation of the R & D programmes of SASMIRA. Referring to the imposition of excise duties, he observed that the taxation system should be uniform and that there should not be any undue burden on one sector only. While enumerating the multifarious activities of SASMIRA, Shri D. N. Shroff, President of the Association, said in his welcome address that the Association was planning to set up an economics wing with a view to making available the results of research to the industry in a manner that was commercially feasible. He said that the Association was setting up two regional centres, one in Surat and another in Amritsar to serve the local technological needs.

In his presidential address, Shri S. Ranganathan (Member of Parliament) stressed the importance of research and development in the industry and said that SASMIRA should make efforts to develop new technological processes to reduce the cost of production of man-made textiles.

In the technology session, Shri J. G. Parikh, Director of SASMIRA, said that a two-generation gap existed between India and the developed countries in the area of man-made fibres. While India was producing first-generation man-made fibres, there have come into existence third-generation fibres, commonly known as speciality fibres or tailor-made fibres, in developed countries as a result of a strong R & D base. If this ever-widening technological gap is to be bridged, massive expansion of man-made fibre industry must take place in India. He felt that the size of man-made fibre plants in India was small to build up a strong R & D base for undertaking research work at plant level. What was required was to import latest technology and adapt it to suit our conditions, he said.

The various technological aspects and problems of raw materials for the man-made fibres were discussed.

The second session was devoted to economic bottlenecks facing the industry and measures to mitigate them.

It was the general opinion of the speakers that a committee should be formed to look into the technological and economic aspects of the industry. Since the man-made textiles were necessities and not luxuries, it was felt that there was need for reviewing the heavy taxation on these textiles.

Medicinal and Aromatic Plants : Symposium at CIMPO

At a symposium organized by the Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, during 24-26 February 1975, recent advances in the development, production and utilization of medicinal and aromatic plants were discussed. Fifty papers spread over agronomy, chemistry, plant breeding and botany were presented.

In his inaugural address, Dr M. Chenna Reddy, Governor of Uttar Pradesh, said that the contribution of CIMPO in the field of medicinal and aromatic plants had been very significant and had led to the cultivation of improved and new varieties of medicinal and aromatic plants having economic potentiality. The laboratory was not only making the country self-sufficient in regard to medicinal and aromatic plant resources but was also helping the country earn foreign exchange through export. Private industries had greatly benefited from the research work carried out at CIMPO. The laboratory had made it possible to grow medicinal and aromatic plants on waste lands, leaving the agricultural lands for growing foodgrains and cereals. The Governor urged the private sector to support through financial contributions the R & D work at CIMPO.

Prof. T. S. Sadasivan, Consultant to CIMPO, National Botanic Gardens, Lucknow and Regional Research Laboratory, Jammu, while welcoming the delegates, gave an account of India's heritage in the field of medicinal plants.

A resume of the activities of CIMPO was presented by Dr S. C. Datta, the Director. Cultivation of plants like *Mentha arvensis* and Citronella (Java) had helped the country save foreign exchange. A number of plants introduced by CIMPO were being grown successfully in the country on a large scale. CIMPO was also producing various plant products in commercial quantities. The laboratory had evolved superior strains of Citronella (Java), lemongrass, palmarosa and coriander. Various industrial concerns were provided planting materials, technical advice and guidance.

Some of the main recommendations made at the symposium are as follows :

(1) Germ-plasm banks of medicinal and aromatic plants should be organized at various regional centres covering different agro-climates of the country. An annual list of holdings and addition of new genetic materials should be published every year.

(2) Multi-purpose breeding programmes should be intensified on *Dioscorea*, *Solanum*, *Pyrethrum*, *Cymbopogon*, *Mentha*, *Ocimum*, *Pogostemon* and *Papaver*.

(3) Researches pertaining to biosynthesis of active principles, with particular reference to diosgenin and solasodine containing plants and Cymbopogons, should be carried out at multi-laboratory level.

(4) In order to test the nature, extent and range of adaptability of new introductions, selections be made and strains evolved by multilocation trials in different agro-climatic regions.

(5) Quick microchemical tests should be developed.

(6) Tissue culture work should be geared to solving urgent practical problems of propagation of elite selections on a commercial basis.

(7) Task forces on collaborative projects of national priority should be organized.

It was felt that the executive committees of various plant-based laboratories should meet once a year to exchange views and to review the progress made on the collaborative projects.

Dr Zaidi Honoured

Dr S. H. Zaidi, Director, Industrial Toxicology Research Centre, Lucknow, has been awarded Sir Ardeshir Dalal Memorial Gold Medal for the year 1975 for his work in the field of occupational health. The award was presented to him at the twenty-sixth All India Conference of the Indian Association of Occupational Health held in Bombay on 28 March 1975. Dr Zaidi delivered Sir Ardeshir Dalal memorial oration entitled 'Dust is dangerous'. He was also chairman of one of the scientific sessions of the conference.

He has made valuable contributions to the etiology and pathogenesis of dust diseases of the lung. He demonstrated that infection plays an important role in accentuating pulmonary dust disease. Zaidi's researches have revealed that the disabling and killing aspects of dust diseases of the lung are due as much to tubercular infection as to the dust-ridden condition of the pulmonary tissues.

Dr Zaidi has worked on the intricate problem of pulmonary massive fibrosis among coalminers. For the first time, he firmly established the etiology of coalminers' lung disease. It was shown that tubercle bacilli of low virulence when combined with coalmine dust produces pulmonary massive fibrosis in the lungs. This finding led to the introduction of pre-screening of tuberculosis in coalminers.

He has also studied the effect of other dusts like manganese dioxide and their modification by an infective agent, *Candida albicans*, commonly occurring as a facultative pathogen in the upper respiratory tract of miners. He conclusively proved that *C. albicans* and manganese dust over a long period interact and develop mature lesions earlier than with the dust or *C. albicans* alone. Further, dust and infection together produce more fibrosis than either of these agents. This finding highlights the role of other infections on the pathogenesis of miner's disease.

Dr Zaidi's studies on the etiology of the farmer's lung have demonstrated that in man a thermophilic actinomycete, *Thermopolyspora polyspora*, plays a part only in the early stages of farmer's lung and that hay dust is the more important pathogenic factor.

In experimental pneumoconiosis, Dr Zaidi has made a critical study of silica solubility, particle size and relationship of the structure of silica to the fibrogenic activity. He has studied the effect of various nutritional factors on experimental silicosis which has given meaningful leads to the solution of health problems of the miners in the developing countries. His studies on biochemical and pathological aspects of asbestosis have been acclaimed as outstanding contributions in this field. His work in the field of mica pneumoconiosis has great significance for mica workers.

CECRI Wins FICCI's Award for 1974

The Central Electrochemical Research Institute (CECRI), Karaikudi, has won the Federation of Indian Chambers of Commerce and Industry's award for 1974 in recognition of its 'corporate initiative in research in science and technology'. The institute has developed wide-ranging processes for industrial products such as porous carbon electrode for air-depolarized cell, silver oxide-zinc accumulator, magnesium-cuprous chloride water-activated batteries, and titanium substrate insoluble anode. Its activities have led to savings in foreign exchange and created employment opportunities directly as well as indirectly. The institute's achievements are of far-reaching significance to the electrochemical industry, and hence call for appreciation.

Dr H. V. K. Udupa, Director of CECRI, received the award on behalf of the institute, at a function arranged by FICCI in New Delhi on 24 April 1975.

Dr Udupa was co-recipient last year of FICCI's individual award for his leadership in research administration and for successfully guiding investigations culminating in industrially exploitable processes.

Electronic Module for Digital Temperature Indicator

An electronic module for a digital temperature indicator using integrated circuit chips has been developed by the Indian Institute of Petroleum (IIP), Dehra Dun. The device uses a thermocouple sensor whose output is fed to a digital panel meter, digital voltmeter or digital multimeter, such as are commercially available, through an electronic module which is the heart of the system. The module has a provision for room temperature adjustment.

This is a low-cost module, costing about Rs 250 including regulated power supply. The module has the following specifications :

Temp. range — ambient temp. 1000°C
Accuracy — 0·2% ± 2 digits
Output impedance — 75 ohms
Mains voltage — 230 V, 50 Hz.

Namda-making Machine : MERADO, Ludhiana

The Mechanical Engineering Research & Development Organization (MERADO), Ludhiana, took up in collaboration with the Regional Research Laboratory, Jammu, the development of a low-cost machine for making *namda* (a kind of woollen mattress). A prototype of the machine has been fabricated on the basis of the MERADO design and is now at the testing stage. The future programme includes detailed testing of its mechani-

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Prototype of *namda*-making machine designed and developed by MERADO, Ludhiana, in collaboration with RRL, Jammu

cal performance, actual production of *namdas* on the machine, and finally its demonstration to manufacturers for collaboration and commercial exploitation.

Namdas are almost exclusively made in the country on a cottage scale. The operations followed are mostly manual, requiring arduous labour. The felting operation, for imparting proper orientation and binding of the fibres into a relatively stable form, is now being done manually by rolling and rubbing the assembled mass of moist wool or other animal fibres with the hands. The development of this machine will eliminate the drudgery of manual operations like rolling and kneeding with feet and rubbing with hands.

Indian *namdas* have a good potential in export market. During 1973-74 *namdas* worth Rs 55 lakh were exported out of a total production value of Rs 75 lakh.

Screed Vibrator for Compacting Concrete

The strength of concrete of stipulated mix proportions depends largely on the degree of compaction imparted to it in plastic stage. Inefficient compaction results in the formation of voids in concrete, which in turn reduce the strength. If the void content is 10%, the strength may be reduced by as much as 50%. Where the exposed surface is large and the thickness of the layer is relatively small as in concrete slabs used for road and airfield pavements, roofs, etc., screed-board vibrators play a very important role in compaction. In such vibrators, a reasonably high amplitude of vibration corresponding to a matching frequency is of primary importance for obtaining efficient compaction.

According to IS stipulations the amplitude of vibration of such vibrators shall not be less than 1·5 mm under 'operation-in-air' condition for efficient compaction. As against this, several major user departments in the country have reported that the indigenously available screed-board vibrators exhibit a rather low amplitude of vibration of the order of 0·4-0·5 mm. Such low-amplitude screed vibrators may be adequate for surface finishing operations but are unable to provide satisfactory compaction beyond the top 10 cm or so. Cases of honey-combing at lower layers of thicker slabs have been reported by airfield authorities.

The Central Road Research Institute (CRRI), New Delhi, has developed an improved high-amplitude screed-board vibrator. It provides an amplitude of vibration in the range 1·5-2·0 mm for matching frequencies of 3600-3800 rpm under 'operation-in-air', the corresponding amplitude and matching frequency ranges under loaded condition being 0·8-1·8 mm and 3300-3600 rpm respectively.

The vibrator (amplitude of vibration, 1·95 mm under 'air operation') can compact up to 25 cm thick slabs with a minimum of 97% efficiency (i.e. 3% voids) at the lower layers as against only 90% efficiency (i.e. 10% voids) in the case of indigenously available screed vibrators having an amplitude of vibration of 0·5 mm under 'air operation'.

The fabrication of the vibrator entails the use of only indigenous materials, and the vibrator costs only as much as the conventional screed vibrators presently available in the market. The operating principles of both the machines are the same. The vibrator conforms to IS stipulations. The use of concrete compactors of the design and type developed by CRRI will improve the quality of concrete pavements, etc. and hence leads to better serviceability and longer life.

Polarization Interferometer : CSIO

The Central Scientific Instruments Organisation (CSIO), Chandigarh, has designed and developed a polarization interferometer. The instrument is used for evaluating microscope objectives and surface figuring of concave spherical surfaces. It provides qualitative assessment in terms of wavefront degradation, thereby substituting the star test, commonly employed for the purpose. It is compact, insensitive to vibrations, and stable; hence it can find varied applications in research and industry.

The device employs the principle of lateral shearing interferometry. Light from the source is focussed by a corrected optical system through a polarizer at the centre of a Wollaston prism. The incident spherical wavefront is deformed as it emerges through the system under test. The deformed wavefront after reflection is sheared, and interference fringes are seen through an analyzer and eyepiece. In this system, the condition for compensation of double refraction is fulfilled, enabling the use of extended white light source.

The wavefront degradation in the test specimen can be assessed up to one-tenth of wavelength by visual estimation.

NML Alloys for Dentures

The National Metallurgical Laboratory (NML), Jamshedpur, has developed stainless steel alloy wire for fabrication of dentures and orthodontic appliances. The alloy is not tarnished either by the fluids of the mouth or various types of foods. It has excellent working properties, can be easily moulded to desired shape, and does not lose its elasticity on heating. It takes high polish and can withstand frequent adjustments.

Tested at the Tata Main Hospital, Jamshedpur, the material compares favourably with imported wires currently being used by the hospital.

The NML-developed silver alloy for filling teeth was also tested at the hospital. The alloy was found to form an amalgam and no case of fracture of filling, as a result of deterioration of the alloy, was reported after one-year use.

CSIO's Practical Electronics Kit

An electronics kit, consisting of a programmed practical book, 100-array matrix board and a set of plug-in modular components, has been developed by the Central Scientific Instruments Organisation (CSIO), Chandigarh. Various applications of linear and digital integrated circuits in different fields of instrumentation, data communication, computer, industrial control, etc. can be demonstrated with the help of the kit.

The programmed practical book, in two volumes, has been prepared for electronics engineering students. It contains 20 experiments on linear and digital circuits and 10 experiments on advanced applications of these circuits. To start an experiment, the transparent matrix board, made of Perspex, is placed on the programmed sheet and the components are plugged into various module bases. The experiments are so designed that each experiment forms an independent building block of a system. They facilitate explanation of how the individual integrated circuit and component functions in a circuit without loss of time on such jobs as soldering, clamping and screwing parts, shaping and stripping wires. The devices and components being modular in construction, the amount of information imparted in a given time and the degree of assimilation are higher than in the case of conventional devices.

Conference Briefs

Shri R. R. Khan of the Industrial Toxicology Research Centre (ITRC), Lucknow, attended, on invitation, the workshop on International Register of Potentially Toxic Chemicals (IRPTC) held at Bilthoven, the Netherlands, from 6 to 10 January 1975. The workshop was organized by the United Nations Environment Programme (UNEP) to help implement the proposal for setting up an International Register of Potentially Toxic Chemicals. ITRC, it may be pointed out, has undertaken the compilation of a Registry of Toxicology.

The workshop decided that the basic concept of an IRPTC would be to use all the information resources from all the countries of the world. It was proposed to establish a network consisting of a central unit and organizationally independent network partners. In accordance with the proposal, a request was made that the Registry of Toxicology in South-East Asia be recognized as a partner of the international network, subject to the approval of the Government of India.

A brief account of the Registry of Toxicology, being compiled by ITRC, was given at the workshop. A compendium of scientific information on health hazards encountered in industry, mines and agriculture, the registry will be the basis for disseminating information on toxic effects, safe limits, preponderance of hazards in specific industries, methods of safe handling of industrial substances, and therapeutic and preventive measures. It is expected to cater to the needs of all the developing countries of the region. International cooperation on the lines suggested at IRPTC workshop would facilitate the exchange of information on global, national and regional levels.

Air-conditioning in Textile Mills

This is one of the eight monographs brought out in the 'Silver Jubilee Monographs' series by the Ahmedabad Textile Industry's Research Association (ATIRA), Bombay. Compiled by S. P. Patel and K. Subrahmanyam of ATIRA, the monograph deals with the various aspects of air-conditioning in the textile industry and also gives recommendations based on the experience gained at ATIRA.

There are very few other industries where control of ambient conditions, particularly humidity and temperature, is as vital to the efficiency of production, qualitative as well as quantitative, as in the textile industry. The monograph gives a good coverage of the recent developments—both theoretical and practical—in this area.

The introductory chapter gives data on optimum levels of relative humidity and temperature recommended for processing of cotton in various sections. Chapter 2, entitled Psychrometry, is devoted primarily to the fundamentals of the control of ambient conditions, and provides useful correlations between the various properties of air. Brief descriptions are also given of the various air-conditioning processes. The next two chapters give technological details, relative merits and capital and operational costs of various air-conditioning and refrigeration systems. Design details of the various components are also included. Chapter 5 deals with fans, air distribution, ducts and air washers. The difficulties encountered in the operation of various air-conditioning plants are dealt with in detail in Chapter 6. Of particular interest are the corrective measures recommended for the commonly experienced errors in ambient conditions. The topics covered in the next three chapters are Heat load, Departmental heating, and Buildings. The last chapter gives details of three unconventional systems recommended by ATIRA for textile mills.

A subject index is also included in this 128-page monograph.

Enquiries relating to the monograph may be addressed to : The Director, Ahmedabad Textile Industry's Research Association, P. O. Polytechnic, Ahmedabad 380015.

Bibliography on Glass-to-Metal Seals

Brought out by the Central Glass & Ceramic Research Institute, Calcutta, this bibliography contains 475 references, published during 1961-70 and culled from 45 Indian and foreign journals. A key-word index is also given at the end.

Enquiries relating to the bibliography may be directed to : The Director, Central Glass & Ceramic Research Institute, Jadavpur, Calcutta 700032.

Bibliography on Welding

The Central Mechanical Engineering Research Institute, Durgapur, has brought out a select and partly annotated bibliography on Welding. The 126-page mimeographed bibliography contains 722 references published during 1969-73 (and available at CMERI) and covers welding of metals and alloys, welding processes and techniques, welding of pressure vessels, and standards on welding.

Further enquiries relating to the publication may be directed to : The Director, Central Mechanical Engineering Research Institute, Mahatma Gandhi Avenue, Durgapur 713209.

CRRI's Refresher Courses

The fourth refresher course in Traffic Engineering and Urban Transportation Planning, of two months' duration, was held from 2 April 1975 at the Central Road Research Institute (CRRI), New Delhi. These courses are organized at the instance of the Planning Commission and the Indian Roads Congress. The present course was inaugurated by Shri J. S. Marya, Director General (Road Development) and Additional Secretary, Ministry of Transport, Government of India, who, in his address, stressed the need for working out inexpensive technologies towards the solution of the traffic problems, as the country could not afford sophisticated technologies adopted in western countries. As regards urban transport problems, he stressed the need for balanced improvement of private vehicles vis-a-vis mass transportation system. The objective of the courses, as explained by Prof. C. G. Swaminathan, the Acting Director of CRRI, are : (i) to train technical personnel in the field of traffic engineering and urban transport planning, and (ii) to form a nucleus to help set up traffic cells in different cities.

Progress Reports

CFRI Annual Report : 1974

The Central Fuel Research Institute (CFRI), Dhanbad, has brought out its annual report (mimeographed) for 1974. The report shows that R & D activities of the institute were concerned with : resource quality assessment, preparation of coal, direct use of coal, conversion of coal, and product improvement and valorization. The institute took up investigations on 123 sub-projects of which 17 were sponsored by various concerns. One was an inter-laboratory project. Twenty-three sub-projects were completed during the year.

CFRI rendered assistance to the Central Water and Power Commission (CWPC) in solving the problems faced by thermal power stations due to the supply of inferior quality coal. Rationalization of the coal transportation from a fewer number of source points was suggested to reduce the quality variation in coal supplies. A method of sampling and quality control of coals for power stations at loading and unloading ends, which reduces the time for ash content assessment to an hour, was evolved by CFRI. The method has been accepted by CWPC and power stations.

The institute has been playing a significant role in the formulation of national policies concerning production of oil from coal. Studies on the amenability of hydrogenation of peninsular coals showed that Raniganj and Garo Hill coals were promising. Plans were under way for setting up a slurry phase hydrogenation pilot plant.

The resource quality assessment of coal and lignite in the country continued to be a major activity of the institute. Borehole coal cores, received from various drilling organizations, were assessed for quality.

During the year, CFRI tackled a number of technical consultancy problems. A survey of domestic fuel requirements in Patna was made at the instance of the Government of Bihar. Sampling and size-weight analysis of mixed size coke in the Durgapur coke oven were done at the request of the Durgapur Projects Ltd. At the request of the Union Ministry of Food and Agriculture, the institute developed a paddy husk-fired combustor-cum-heat exchanger for preheating air for paddy drying. The design drawings of the model unit were supplied to the Ministry. Some of the other projects investigated by CFRI are related to : utilization potentialities of coal from Tanzania; relative size stability of different size fractions of r.o.m. coal for Talcher Thermal Power Station; scrutiny of tenders for Sudamdih and Monidih washeries of Bharat Coking Coal Ltd;

techno-economic feasibility study on the production of smokeless fuel and gas for Patna at the request of Bihar Government; planning of coal gasification plants at Calcutta and Bombay; feasibility of production of domestic pellet coke for BCCL; solving the heating problems in Giridih coke ovens of NCDC; finding a substitute for imported anthracite to meet the needs of rubber industry; and utilization of low-volatile semi-anthracite coals of Jammu & Kashmir state in kiln industry.

Agreements were signed with a number of engineering firms for commercialization of processes relating to : production of anthracene, pellet coke from inferior-grade coals/coal products, cresol/naphthol/resorcinol from coke oven byproducts, and narrow brick retort LTC for domestic coke production.

CFRI collaborated with engineering consultants in designing the proposed 500 tonnes/day coal throughput formed coke plant at Talcher for the Coal Mining Authority Ltd.

The selective agglomeration technique for demineralization of coal, developed earlier, was further economized by reducing the time of grinding and conditioning and also by developing a cheaper variety of oil. A 5 kg/hr test unit was set up at the institute and a 2 tonnes/hr pilot plant was being planned for installation by BCCL. The technique was found to be very efficient for upgrading washery slurry.

Non-bituminous binders have been developed by using which domestic briquettes could be prepared from coke breeze. By the application of CFRI pelletization technique, pellet coke of metallurgical quality was made from sub-standard Gidi coal in blend with prime coking coal.

An inexpensive continuous devolatilizer suitable for devolatilizing green pellets and briquettes for production of domestic fuel was developed.

A new fluid-bed combustor of capacity 10 kg/hr was designed and erected. A combustion efficiency of about 90% was recorded in some cases. The institute collaborated with CMERI, Durgapur, and Bharat Heavy Electricals Ltd in developing the design of a 5450 kg/hr fluid-bed combustion boiler.

Techniques were developed by the institute for production of carbon artefacts such as carbon electrode, electrode carbon blocks and brushes.

Because of the non-availability of sufficient quantity of petroleum coke to meet the demand in different electrothermal and electrolytic furnaces, attempts were made to obtain high yields of coal extracts by solvent extraction of bituminous coking coal for subsequent production of low-ash coke. A few industrial firms are interested in the process. At the request of NRDC and R & D Division of Hindustan Steel Ltd, a proposal including pre-design cost estimate for a pilot plant for the production of deashed coal (throughput capacity, 500 tonnes/year) and coke by means of solvent extraction was prepared.

In the field of development of chemicals based on coal byproducts, laboratory-scale studies were completed on processes for the preparation of maleic anhydride, phthalic anhydride, anthraquinone, maleic hydrazide, cresols, naphthols, resorcinols and a pre-emergence herbicide (Alanap).

Ammonium polycarboxylate, a coal fertilizer developed recently, was prepared and sent to the Indian Agricultural Research Institute for field trials.

Thirty-nine research and review papers and sixteen technical reports were published. Nine patents were filed during the year.

CSIR Support To Research

Completed Schemes

Physico-chemical Studies on Substituted Thioureas and their Metal Complexes

Amongst the various sulphur donor compounds, thiourea and its derivatives (used in the manufacture of dyes, elastomers, plastics, textiles, etc.) have been studied extensively. Many workers have made attempts to correlate the structures of these compounds with their antitubercular, plant regulator and other biological activities. The effect of substituents on the electronic spectra, tautomeric behaviour, and ionization of a number of substituted thioureas was studied by Shri B. C. Kashyap* (a CSIR research fellow) under the guidance of Prof. Samir K. Banerji at the Birla Institute of Technology and Science (BITS), Pilani. The compounds chosen were N-aryl, N′-2-(5-halo-pyridyl) thioureas (where aryl is phenyl or *o*-tolyl and halo is chloro, bromo or iodo). Solvent effects on the ultraviolet spectra of these compounds were also investigated. The metal complexes of these compounds were synthesized with Co(II), Ni(II), Cu(I), Zn(II), Cd(II) and Hg(II).

In the UV spectra of these compounds, it was observed that the λ_{max} in iodo-substituted thioureas occurred at longer wavelengths than the chloro- or bromo-substituted thioureas. The enethiol content in the acetonitrile medium was found to be in the order : PIth > TIth > PBth > TBth > PCth ∼ TCth (P, T, C, B and I denote phenyl, *o*-tolyl, chloro, bromo and iodo groups respectively; 'th' stands for thiourea). PIth and TIth were found to be weaker acids than PBth and TBth, and PCth and TCth were found to be strongest. These observations have been explained on the basis of electron-donating powers of the halo substituents in the pyridyl ring. The substituents, being at para postition to the thiourea unit, donate electrons to the thiocarbonyl group. Because of this shift of electrons the sulphur prototropy increases and the hydrogen is strongly held with the sulphur atom. As the electron-donating power of the halo groups is in the order $Cl < Br < I$, the enethiol content was found to be maximum in PIth and TIth and minimum in PCth and TCth. Also, as there are more electrons with the thiocarbonyl group in PIth and TIth, lesser energy is required for a π-π^* transition. This is reflected by the positions of the transition bands (λ_{max}), i.e. the transitions in PIth and TIth occur at longer wavelengths. For the same reason, PIth and TIth are weaker acids and PCth and TCth are the strongest. The effect of changing N-phenyl to N-*o*-tolyl was relatively small and could be explained on the above lines. Here, *o*-tolyl is a stronger electron donor than the phenyl group.

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*Presently at the Publications & Information Directorate (CSIR), New Delhi.

The UV spectra of these compounds were taken in a series of solvents of varying polarities. A blue shift was observed on going from non-polar to polar solvents. The plots of excitation energies of transition bands versus *Z*-value (a solvent polarity parameter) were scattered; the deviations from the regression line could not be explained due to lack of information on the specific solute-solvent interactions, self association and distorted cybotectic region in bulky solute molecules.

In the metal complexes of the substituted thioureas, pyridyl nitrogen and sulphur acted as donor atoms, giving rise to a six-membered chelate ring. These compounds formed 1 : 2 complexes with Cu, Co, Ni, Zn and Hg, but 1 : 1 complex with Cd. Cu(II) was first reduced to Cu(I) and then the complex was formed. All the complexes, except those with Zn, were non-electrolytes. Cu, Co, Ni and Hg complexes had an octahedral environment.

Shri Kashyap was awarded the Ph.D. degree of BITS for his thesis based on these studies.

Administrative Management Training Programme

The fourth course on Administrative Management under the CSIR Management Training Programme will be conducted at the Central Drug Research Institute, Lucknow, from 14 to 24 July 1975. The participants will be mainly drawn from among the Section Officers of the laboratories in the northern region. Because of the interest evinced in these courses by R & D organizations outside CSIR, a few nominees from such organizations are also proposed to be included.

This course will lay emphasis, as earlier, on role clarity, modern theories and techniques in personnel administration, O & M and overall R & D management.

Further details can be had from : The Coordinator, Management Training Programmes, Room No. 91, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001.

Advisory Committee for CSIR News

An Advisory Committee for *CSIR News* has been constituted. Its members are :

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COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 5/75

It is proposed to appoint a Scientist in the grade of Rs 2000-125/2-2500 at the Indian Institute of Experimental Medicine, Calcutta, a national laboratory under the Council of Scientific & Industrial Research. Candidates must have high academic qualifications and established reputation on the basis of distinctive contribution in a field of science related to the activities of this institute. They must have leadership qualities and flair for planning, organization and conduct of high-grade research and development in which a diverse variety of scientists are involved.

On the basis of his performance, the scientist now appointed to this post may also be considered for appointment as Director of the institute within a period of about two years. Therefore, the selection will be done with this in view. The Director's scale of pay is Rs 2500-125/2-3000.

Candidates for this appointment are required to submit initially their *curriculum vitae* in a standard proforma but may be called upon to visit the institute at Calcutta, spend some time there and submit what in their opinion should be the basic charter of the institute, its goals and objectives and the specific tasks it should undertake in the short term and in the long term in pursuance of the objectives. It may be necessary to re-draw the plan of this institute and reformulate its programmes. This may even involve a partial or total change of complexion of this institute and, perhaps, its name also, if need be. Interested candidates may be, therefore, required to submit a 'design' which in their opinion could make the institute dynamic and purposeful to subserve clearly the identified national needs.

The person selected will be appointed on contract for a period of 6 years in the first instance. Age should be below 50 years.

Scientists interested may obtain a copy of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. Completed *curriculum vitae* proforma must be received in this office on or before 6 August 1975.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

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Ground Water Resources Development : Indo-German Workshop

The National Geophysical Research Institute (NGRI), Hyderabad, organized a workshop on Approaches and Methodologies for Development of Ground Water Resources from 26 to 30 May 1975 in collaboration with the Federal Institute of Geosciences & Natural Resources (B.G.R.), Hannover. Organized under the Indo-German Collaboration Agreement, the workshop was co-sponsored by the Central Ground Water Board (CGWB) and Andhra Pradesh State Department of Ground Water. More than 30 papers were presented in the following seven areas : demand and utilization of ground water resources, hydrological studies, geophysical exploration for ground water and studies in Lower Maner Basin, simulation studies, water in unsaturated zones, isotope hydrology, and management of ground water resources.

The need for setting up a high-level Water Resources Council for defining the policies of water management in the country was stressed by Prof. K.R. Ramanathan, Chairman, National Committee for International Hydrological Programme, in his inaugural address.

While welcoming the participants, Dr Hari Narain, Director, NGRI, and Surveyor General of India, pointed out that land, soil, water and forests were interdependent natural resources. Similarly, ground water and surface water were two different components of the same hydrological cycle. Problems of such components need to be dealt with in an integrated manner. The Director expressed concern over the unutilized water resources of the country. In his keynote address, Shri D. S. Deshmukh (CGWB) said that the heavy ground water withdrawal in some parts of the country had caused regional water level declines which would have impact on the industries utilizing the ground water resources. Mehsana district in Gujarat was cited as an example. While this may be considered an adverse effect, disappearance of water-logged land in Punjab and Haryana, which was a cause of concern in recent past, was cited as its beneficial aspect. It was necessary to extend and maintain a national surveillance system for monitoring the changes that were taking place. He stated that CGWB was contemplating the establishment of modern data storage and retrieval systems. He also mentioned the proposal for setting up of a Ground Water Technology Institute for training personnel for manning the water resources exploration, development and management facilities.

Prof. H.J. Durbaum, Director, Bundesanstalt fur Geowissenschaften und Rohstoffe, Hannover, referred to the new Indo-German agreement on scientific and technical cooperation which provided the means for scientific meetings and workshops. A joint multidisciplinary pilot project on ground water basin study had been started with the German participation last year in the Maner basin. It was also being used for training purposes, provided in the Indo-German technical aid programme, Prof. Durbaum said.

In the technical sessions it was observed that ground waters were being increasingly utilized and managed to meet the requirements of agriculture and industry. Modern water and soil management techniques, such as irrigation scheduling, artificial recharge, watershed management, artificial rainmaking, and desalination of saline water, were recommended to meet the increasing requirements of water.

Studies undertaken in different types of areas, viz. alluvial basins, karstic areas, Deccan Traps, hard rock and arid tracts in India were presented and their findings discussed. The complimentary role of geology, geophysics and hydrology was emphasized and supported by an actual study undertaken in a river basin (Kotabaru). Sophisticated simulation and modelling studies for optimum utilization of ground water systems were presented by German experts. Their utility in specific areas and limitations due to lack of basic data were discussed.

Geophysical, photogeological and hydrogeological studies undertaken in Lower Maner Basin were presented and discussed at length. The basin is drained by the Lower Maner River and its tributories and forms part of the main Godavari River Basin. The studies have revealed valuable information on the characteristics of the water-table in the area.

Problems of irrigation in semi-arid and arid zones were presented and discussed. Migration of moisture in such unsaturated zones has been traced. Lack of suitable technology for land and water management to facilitate dependable crop production was identified as a lacuna. It was suggested that a system of ground ridges and furrows is effective in reducing the surface run-off and soil erosion. Small water resources develop-

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ment projects along watersheds appeared to be attractive.

Potentialities of the use of artificial or natural isotopes such as ^{3}H, ^{32}Si and ^{14}C for estimation of recharge and dating of ground waters were presented and discussed. Measurements of tritium concentration at various depths in soil samples, collected from a location in Andhra Pradesh, have indicated an infiltration rate of 0.8 m/year for sandy soils in the area. Radiocarbon data from Jaisalmer (Rajasthan) and Mehsana (Gujarat) were also illustrated. Similarly, data on recharge for several years from Uttar Pradesh, Haryana and Punjab have been obtained. It seems that water-logged areas remain deficient in recharge, which can be enhanced in some areas by pulling out the water from water-logged areas.

Integrated use of surface and ground water resources to mitigate floods and droughts as well as to meet the requirements of increased population, agriculture and industrial activity was focussed in the session on management studies.

Presenting his paper on Ganga-Cauvery link, B.G. Deshpande (Poona University), said that since 85% of the rainwater is received from monsoon during a period of 3-4 months, the surface transportation of water to scarcity-hit areas through a link canal system could be an interesting possibility. The Ganga-Cauvery project entails an investment of about Rs 29,000 million spread over nearly 30 years. This would help in transfer of water from surplus to deficit areas, flood control, navigation, trade and commerce, besides leading to other benefits such as irrigation of about 10 million acres of land.

S. Rama of the Tata Institute of Fundamental Research, Bombay, while presenting his paper on 'Reclamation of Rann of Kutch', said that by improving the drainage of the area and by stopping the inflow of the sea-water, it was possible to wash the surface soils of water-soluble salts. He also proposed enhanced recharge of ground water basins through cyclic operation of the acquifers associated with seasonal streams. The digging of more tube-wells near seasonal rivers and tributories was recommended in order to draw water so that more water could get in during monsoon months. Similarly, drawal of more water from tube-wells in heavy rainfall areas was proposed to accommodate more recharge.

B.B.S. Singhal (Roorkee University) discussed the problems of water-logging, its causes and remedies. Measures to avoid water-logging, as indicated by Singhal, included suitable lining of canals to avoid seepage of water, planned irrigation and drainage in cultivated areas, besides pumping.

Enhancement of artificial recharge to ground water reservoir by underground bunds was suggested by T. G. Ratanparakhi (IRI, Poona). Two such underground structures built across the River Sina in Ahmednagar District had caused the water level in nearby wells to rise in the month when it used to begin to drop.

The concept of systems approach to the management of a river basin was introduced and discussed at length.

The workshop concluded that there was an urgent need for greater coordination and active cooperation between various organizations, agencies, universities and the ministries concerned with ground water resources to make a concerted effort for obtaining quick results in Lower Maner Basin and in other areas needing integrated studies.

The workshop also recommended quick and large-scale investigations and drilling programmes, with greater inputs in all the priority areas within a period of seven years. These should be preceded by geophysical exploration and water management studies employing nuclear, hydrological and simulation techniques.

Technology Exhibition and Science & Industry Get-together

A one-week Technology Exhibition (CSIR) and a Science and Industry get-together were held at the Birla Industrial & Technological Museum (BITM), Calcutta, from 26 April to 2 May 1975. The exhibition and the get-together were organized under the joint auspices of some of the CSIR laboratories, the Indian Jute Industry's Research Association, the Small Industries Service Institute (SISI), Calcutta, and the Federation of Associations of Small Industries of India (FASII), Calcutta.

Twenty-six CSIR laboratories, SISI, the National Research Development Corporation of India, and the Directorate of Cottage and Small Industries of West Bengal Government participated in the exhibition which highlighted the technologies developed in CSIR laboratories for utilization by small-scale entrepreneurs. The exhibition also facilitated flow of know-how to prospective entrepreneurs, through demonstration and discussion. Some of the inventions and processes exhibited related to : powered cycle rickshaw, educational buildings, patient monitoring system, tide and wave recorder and counter, plywood grain storage bins, process for dehydration of fresh flowers and foliage, TV test instruments, TV service wobbulator, oil of Japanese mint, fungal acid protease, bleaching earths, methyl anthranilate from phthalic anhydride, hydraulic pit prop, sponge iron for primary steel and mini steel plants, re-refining of used lube oils, stomach leather, and optical glass pieces.

Discussions at the get-together related mostly to the measures to ensure translation of technologies into commercial practice by small-scale industrial units and entrepreneurs. Towards this end the get-together recommended, among others, the setting up of a multi-disciplinary CSIR complex in Calcutta. The get-together also emphasized the need for setting up a technical information cell in the region, preferably at BITM.

The function was inaugurated by Shri Shankar Ghosh, Finance Minister, Government of West Bengal, and was presided over by Dr Zainal Abedin, Minister for Small Scale Industries, Government of West Bengal.

STUDIES IN SOLID STATE PHYSICS

Bhatnagar Prize-winner Dr Joshi's work

Recently there has been an explosive surge of interest in the field of electronic states in disordered alloys, amorphous semiconductors andliquid metals.

Dr S.K. Joshi

Dr S.K. Joshi has made novel contributions relating to the theory of disordered systems, electron correlations in narrow band solids and the related problem of Mott transition. The theory of phonons in transition metals has also been the subject of study by Dr Joshi.

Dr Joshi has proposed a number of models for studying electrons in disordered alloys. These models have been used to study spectral functions and density of states for electrons in a number of binary alloys. The predictions from these models agree with the results of optical, photoemission and and positron annihilation. Electronic transport in disordered alloys has been studied by adopting a tight-binding approach. The problem of localization of non-interacting electrons in an extended system for high degree of disorder and the problem of electrons in liquid metals are interesting lines of investigation. In the theory of metals, the localized electrons are assumed not to have the ability to transport charge or energy and Dr Joshi used a non-perturbative approach based on a model of independent pseudoatoms to calculate the electronic density of states of liquid aluminium and liquid beryllium. The problem of phonons in disordered Si-Ge alloys was also studied because Raman and infrared measurements were available for the system.

Another important contribution made by Dr Joshi is towards the solution of the problem of the electron correlation in narrow energy bands possessed by the transition and rare earth metals, their compounds and alloys. The effect of such correlations has often been studied through the Hubbard model. The model was extended to include the intersite Coulomb interactions and *s-d* interactions, and the improved model has been used to study the instability of the paramagnetic phase against the ferromagnetic and antiferromagnetic phases. The model also helps in a better understanding of experimental results on pressure-induced metal-nonmetal transitions known as Mott transition. The spin wave spectrum of transition metal oxides was studied for a modified Zener model, where it was assumed that some of the *d* electrons are localized at lattice sites and the others are itinerant. The effect of disorder on the magnetic behaviour of a material has been analyzed through the Hubbard model and it has been shown that positional disorder could induce a transition from paramagnetic to ferromagnetic phase. Attempts have also been made to understand the problem of transition-metal impurities in a metallic environment by considering two doubly degenerate impurities and using the functional integral approach.

There existed almost no microscopic theory for phonons in transition and noble metals. Using the non-interacting band model, Dr Joshi has given a microscopic approach for the dielectric screening in transition and noble metals. The model has been used to study the phonon spectra of a number of transition and noble metals.

Dr Joshi has also studied excitation and ionization processes in atoms, ions and molecules due to the impact of charged projectiles like those of electrons and protons. The Glauber theory has been used to study the collisions of electrons with simple atomic systems. The study of these collision processes is of interest in plasma confinement, in astrophysical problems and study of the physics of the upper atmosphere.

Dr S.K. Joshi has been selected for the Shanti Swarup Bhatnagar Prize in the physical sciences for the year 1972 (jointly with Prof. S. Chandrashekhar) [*CSIR News*, **25** (1975), 72]. Presently, he is Head of the Physics Department of the Roorkee University.

INTERACTION OF HIGH-ENERGY PARTICLES

Bhatnagar Prize-winner Prof. Singh's Work

Prof. Virendra Singh has made valuable contributions in the field of interaction of high-energy particles. A brief account of his work is presented below.

Analyticity in the complex angular momentum plane

Prof. V. Singh

Investigations on Regge poles in Coulomb scattering amplitude provided the first solvable example to test various ideas and conjectures. A definitive treatment of Regge poles in pion-nucleon scattering and its crossed channels was obtained and applied in further investigations. Original investigations on Lagrangian field theories leading to Regge poles after-sum perturbation mation of theory diagrams have also been made by Prof. Singh in the case of elementary particles.

Symmetries of strong interactions

Sum rules which take into account the octet symmetry breaking of the unitary SU(3) symmetry have been derived for the decay of decimet baryon resonances. A description of mass pattern in the broken SU(6) symmetry was given and related to mass splittings SU(3) baryon decimet and octet.

Bootstrap dynamics and symmetries

Whether symmetries can arise out of bootstrap dynamics was explored in a series of investigations. The Lie group of strong coupling theory was utilized for explaining the baryon spectrum in this connection.

Prof. Virendra Singh has been selected for the Shanti Swarup Bhatnagar Prize in the physical sciences for the year 1973 [*CSIR News*, **25** (1975), 72]. Presently, he is Professor of Theoretical Physics, Tata Institute of Fundamental Research, Bombay.

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Exact bounds for high-energy scattering amplitudes

The investigation of the exact consequences of general principles such as analyticity, crossing and unitarity was a worthwhile, though rather difficult, task. Some of the major results and revival of the interest in the field have come about through the work of Prof. Singh and collaborators. Particular mention may be made of the unitarity bounds on the elastic absorptive parts, which are quite useful in the diffraction peak region, and bounds on total particle-antiparticle cross-section differences involving charge exchange cross-section.

Current algebra and threshold theorems for Compton scattering

The existence of fixed Regge poles in current amplitudes was pointed out by Singh and coworkers simultaneously with Low *et al.* The classical threshold theorems for Compton scattering were shown, contrary to expectation, to be extendable to both higher orders in photon energy and fine structure constants.

Recent investigations by Prof. Singh are concerned with newly discovered, extremely narrow, psi particles.

STRUCTURAL, STRATIGRAPHIC AND METAMORPHIC STUDIES

Bhatnagar Prize-winner Prof. Naha's Work

Prof. K. Naha has carried out extensive geological studies on the Simla Himalayas and the Rajasthan Precambrians. The structural, stratigraphic and metamorphic studies in the Simla Himalayas have shown the presence of recumbent-reclined folding. Over-thrusting in the Jutogh-Chail Series has proved the presence of the structures of three generations interspersed with metamorphism in two phases in the Jutogh Series and elucidated the stratigraphic succession within the series from primary top-and-bottom features. Methods of recognizing overthrusts in metamorphic terrains involved in polymetamorphism and superposed deformations have been utilized in elucidating the structure of the Simla klippe. These studies have provided concrete evidence against the prevalent notion that metamorphism in the Jutogh Series is Precambrian in age, and that a vestige of the Precambrian Aravalli orogenic trend remains in this part of the Himalayas.

Investigations made by Prof. Naha and coworkers on some of the oldest rocks in the Rajasthan Precambrians have led to a complete revision of the structure and stratigraphy of the Aravalli-Raialo rocks and the Banded Gneissic Complex of the type area in central Rajasthan. The study has demonstrated the presence of structures of three generations in large scale, with EW-trending isoclinal folds of varying axial planes (because of coaxial refolding) affected by NNE-trending upright folds of varying intensity. On these structures, conjugate folds and kink bands have developed locally because of gravity-generated compression, followed by NE-SW sqeezing. The Aravalli-Raialo rocks have been shown to be a conformable sequence older than the Banded Gneissic Complex of the type area, the latter representing the migmatized portions of the metasediments. Evidence for granitic rocks of at least two generations in the Early Precambrian of Rajasthan has been adduced. These findings have been confirmed by radiometric dating of carefully selected samples by different workers.

The variation of regional metamorphism with stratigraphy and structure in space, and with movement phases in time, have been studied by Prof. Naha in the Simla Himalayas. Structural data from the scale of map to hand specimen, and metamorphic textures in the scale of thin section, have been brought to bear on the question of time and space relations of progressive regional metamorphism.

Methods of elucidating the large-scale structures of migmatites by tracing relict metasedimentary bands in their folded attitude and by analyzing them in association with minor deformation structures have been developed. These methods have been successfully utilized in tracing the detailed history of superposed deformations in the Banded Gneissic Complex of central Rajasthan.

The geometry and mechanism of folding in general and superposed folding in particular have been worked out, and the principles fruitfully applied to unravel the structural history of the Precambrian rocks of central Rajasthan and of the Jutogh-Chail rocks of the Simla Himalayas. Methods of recognizing coaxial folding prior to superposed noncoaxial deformation have been developed, and the nature of variation due to superposition of upright folding of varying intensity on isoclinal folds of diverse orientation has been clarified. In the Precambrian terrain of central Rajasthan in particular, the shapes of folds of different generations, the behaviour of early lineations involved in later folding, and the orientation of late-stage conjugate folds and kink bands have been utilized in analyzing the style, sequence and amount of strain in the rocks and in calculating the amount of homogeneous strain and buckle shortening that the rocks have undergone.

Synthetic Rutile from Ilmenite

Synthetic rutile is used for coating welding electrodes, and for the production of pigment-grade titanium dioxide, titanium metal and its alloys. The Regional Research Laboratory, Bhubaneswar, has developed a process on kilogram scale for producing synthetic rutile from ilmenites. The process consists in the partial reduction of ilmenite with cheap solid reductants to convert most of the ferric oxides, present in the mineral, to ferrous oxide at 1000°C for 30-60 min. The partially reduced ilmenite is leached with dilute hydrochloric acid (about 20%) in a specially designed column reactor, where the acid is fed and the leach liquor is removed continuously.

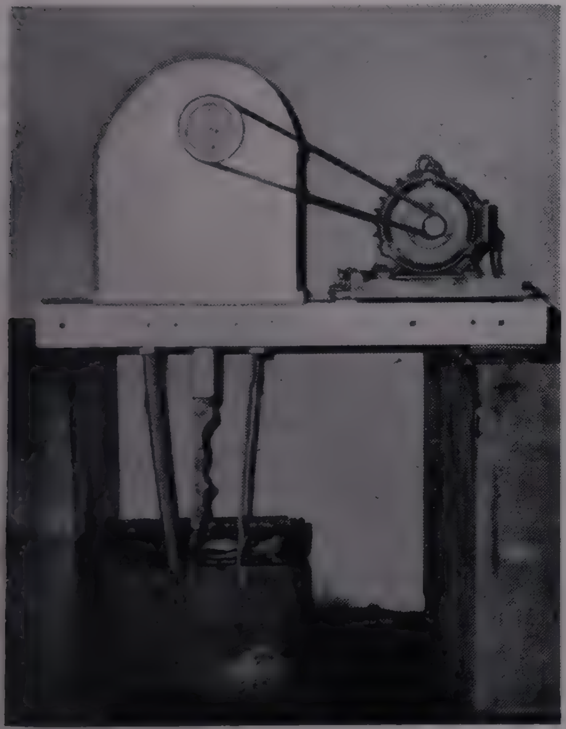
Prof. Naha has been selected for the Shanti Swarup Bhatnagar Prize in geological sciences for the year 1972 [*CSIR News* **25** (1975), 72]. At present, he is Professor of Geology at the Indian Institute of Technology, Kharagpur.

Washing of the product is also carried out in the same reactor. Electrolysis of the acid-free liquor is then done to obtain high-purity iron powder and chlorine. It has been proposed to scale up the process to pilot plant level.

MERADO Designs Belt Pump for Water-lifting

A belt pump useful for lifting water in those areas where water levels are very low has been designed and developed by MERADO, Ludhiana. The discharge of the pump is independent of the depth from which it is lifting water. A prototype of the pump has been made. After preliminary testing of the pump, modifications are being effected.

The pump can lift water from deep wells irrespective of the water-table by incorporating a higher horse-power motor. The pump can also be operated manually during power shut-downs.



Prototype of belt pump designed and developed by MERADO, Ludhiana

Indian Literature in Environmental Engineering

References to as many as 968 papers relating to environmental engineering are included in the annual bibliography for 1972 brought out by the National Environmental Engineering Research Institute, Nagpur. These papers were culled from 84 Indian and 8 foreign journals and 43 reports/proceedings of conferences. A detailed subject guide, an author index and a geographical index are included. Enquiries relating to the publication may be addressed to : The Director, National Environmental Engineering Research Institute, Nehru Marg, Nagpur 440020.

Progress Reports

RRL, Bhubaneswar Annual Report : 1974

The annual report of the Regional Research Laboratory (RRL), Bhubaneswar, for the year 1974 records the progress of R&D work under the following disciplines : Minerals and metals; Inorganic chemicals; Forest and marine products; Aromatic and medicinal plants; and Process engineering. Projects of national and regional importance completed during the year on laboratory/bench scale included : reduction of phosphorus content of high-phosphorus manganese ores; beneficiation of low-grade limestone; beneficiation and agglomeration of aluminous iron ore fines; utilization of fly ash for the manufacture of refractory-grade thermal insulation bricks; pigment-grade red oxide of iron from pickle liquor of steel plants; and small-scale fish meal plants.

Project reports on (i) production of strychnine and brucine from nux-vomica seeds, and (ii) extraction of nickel and cobalt from lateritic nickel ores of Orissa were prepared. Four processes, viz. (i) steam distillation unit for extraction of essential oils, (ii) hand-operated bellow pump, (iii) earth auger, and (iv) methyl anthranilate from phthalic anhydride, were taken up by various industries for commercialization.

Studies were undertaken on the beneficiation of low-grade limestone of Dungri quarry (Sambalpur). Microscopy and X-ray studies indicated that the limestone samples consisted mainly of calcite, quartz, feldspar and dolomite. The major gangue was silica (19-27%), and calcium carbonate content in the samples varied from 61·0 to 68·5%. Flotation studies on kilogram scale were carried out using an anionic collector for calcium carbonate, suitable depressants for silica and a conventional frother. It was possible to upgrade the limestone to a product containing 78·5-81·5% of calcium carbonate depending on the feed, with more than 75% recovery.

From an aluminous iron ore sample (Daitari) analyzing to Fe, 60·77; Al_2O_3, 3·34; SiO_2, 1·46; and L. O. I., 7·26%, an acceptable burden for blast furnace was prepared. The process consisted in blending the ore with silicious iron ores (BHQ) of various percentages and grinding to −300 mesh and pelletizing. The heat-hardened pellets with 4% BHQ (containing Fe_2O_3, 65%; SiO_2, 3·5% and Al_2O_3, 3·5%) was found to satisfy blast furnace charge specifications.

Fly ash from the Talcher thermal power plant was successfully utilized as an ingredient in the manufacture of refractory as well as hot-face insulation bricks. Studies were carried out to lower its Fe_2O_3 content which is detrimental to refractory products. Bricks made from beneficiated fly ash along with other ingredients (plastic clay, grog, etc.) were tested for physical and chemical properties and found satisfactory.

In view of the acute shortage of cellulosic raw materials for paper industry, research for new pulpable material is essential for its future expansion. Silver oak, which is available in the region, was evaluated for pulping by the use of neutral sulphite semi-chemical process. The pulp was found suitable for making board, paper and paper boards. Depithed corn stalk, an agricultural waste, could be pulped to 50-52% yield without loss of strength characteristics; the pulp was found suitable for the production of writing, printing and wrapping papers.

A unit for processing 50 kg/batch of fish meal was designed and fabricated. Experimental trials on the unit for the production of fish meal without the use of boiler were completed. The unit can be used for making fish meal on a cottage scale.

During the year, 700 plant specimens were added to the herbarium, raising the total number of specimens in the herbarium to 1600. Ninety samples collected from different parts of Orissa were screened for alkaloids, flavonoids, saponins and tannins; a number of new sources of these compounds were discovered.

A test loop (75 mm diam, 60 m length) with necessary slurry pump and preparation system was set up for collecting data for designing a long-distance pipeline for hydraulic transportation of materials. This test facility will be utilized in the first instance to evaluate the suitability of high-density polyethylene pipe for slurry transportation by assessing the abrasion characteristics. The project is sponsored by a private party.

Work was taken up to improve the design of cowdung gas plants as a result of which the dung requirement could be supplemented with waste green leaves. A prototype garbage gas plant with a gas holder capacitor ($2m^3$) was constructed.

A prototype air classifier which can be used for large-scale classification of powdery material into discrete sizes in the sub-sieve range was fabricated and installed.

Significant progress was also made on a number of projects, viz. preparation of pre-reduced pellets/ sponge iron from lumpy/ or fine iron ores, utilizing high-volatile coals; upgrading of silicious ferruginous bauxite ores; beneficiation of sillimanite of Sambalpur region (Orissa) and galena of Sargipalli (Orissa); preparation of silicon carbide heating elements; preparation of carbon granules for telephone industries; preparation of chromium chemicals including sodium dichromate; preparation of iron oxide pigments from ferrous chloride liquors; and cultivation of cinnamon.

Twenty-three research papers were published and 13 patents were filed during the year.

CSIR Support To Research

New Schemes

Conformation and Conformational Transition in Macromolecules

In a new CSIR research scheme granted to him, Prof. V. D. Gupta of the Physics Department, Lucknow University, Lucknow, proposes to study the conformation and conformational changes in simple proteins and polypeptides from both experimental and theoretical viewpoints. Experimentally, X-ray diffraction, infrared absorption, Raman scattering and UV absorption techniques will be used. Theoretically, the theory of cooperative phenomenon, stochastic processes and principles of lattice dynamics of one-dimensional systems will be used. Small X-ray scattering provides information on the organization of macromolecular chains, and following the theoretical developments by Vand and Crick, it is also possible to obtain information about the internal structure of these helical systems. Simple polyamino acids serve as model compounds for understanding the behaviour of more complex systems. It is, therefore, planned to study first the polymers of glycine, alanine, proline, hydroxyproline, and glutamic and aspartic acids.

A long-chain molecule in solution has not only translational and rotational motion but also undergoes internal vibrations, which arise from the stretching of bonds, bending of bond angles and variation in dihedral angles of rotation around single bond. The nature of these internal motions depends on the conformation and conformational energy, and these would be reflected in the conformation-sensitive low-frequency modes and the nature of their dispersion. The scheme thus aims at a study of the low-frequency normal modes of vibration and their dispersion in various polypeptides and examination of the problem of thermal transition as a vibrational catastrophe.

Synthesis of Heterocyclic Compounds of Pharmacological Importance

In a new CSIR research scheme granted to him, Prof. D. Nasipuri, Department of Chemistry, Indian Institute of Technology, Kharagpur, proposes to carry out total and economic synthesis of a variety of heterocyclic compounds, mostly polycycles containing N, O and S. One aspect of the research is to develop new synthetic methodologies in organic heterocyclic chemistry and the other is to use them fruitfully for the synthesis of biologically active molecules and compounds of pharmacological importance to be subsequently used as drugs. The study is also expected to establish the structure-action relationship in biologically active molecules. Considerable amount of work has been done under a previous CSIR research scheme in this laboratory. New methods for the synthesis of heterosteroids in which one or more of carbon atoms in a steroid molecule are replaced by hetero-atoms have been reported. Literature reveals that such molecules may act as endrocrine agents with a novel spectrum of biological activity. The most important group of compounds intended for synthesis and biological testing are polycyclic compounds with a beta-lactam ring moiety. In view of the importance of his ring system in inducing drug activity, it would be interesting to see the effect of modified steroidal compounds in which one of the rings is replaced by beta-lactam. It is also proposed to undertake some new approaches to the synthesis of colchicine type of molecules which will allow variation of substitution patten in the aromatic ring.

Isolation and Purification of L-Asparaginase from Mycobacteria

The enzyme L-asparaginase has been found to inhibit the growth of certain tumours by depriving them of the essential amino acid L-asparagine. In 1969, T. Ramakrishnan and his colleagues at the Microbiology & Cell Biology Laboratory, Indian Institute of Science, Bangalore, showed that L-asparaginase from the avirulent strain of *Mycobacterium tuberculosis* inhibits the growth of Yoshida ascites sarcoma in experimental rats. In a new CSIR research scheme sanctioned to him, Prof. Ramakrishnan proposes to screen other mycobacteria for the presence of L-asparaginase, isolate and purify it in large quantities from the best source, and use it for clinical trials in cases of tumours which are sensitive to it.

L-Asparaginase from mycobacteria has the advantage over the enzyme obtained from conventional sources in that it is free from endotoxin and L-glutaminase which have to be completely absent in the final product. It is also necessary to have the enzyme from different sources available for clinical trials since antibodies formed in the body against the enzyme from one source may not be active against that from another source; thus the clinician has a battery of enzymes at his disposal to treat cases which become resistant to one form of L-asparaginase.

Ion-transport Linked Excitability of Human Neuronal Cell Membranes

Biological cells have either electrically excitable or non-excitable membranes. Excitability of membranes, i.e. the variation in ionic conductance with respect to the applied field, turns out to be negative resistance characteristics on the I-V (current-voltage) plot. Cellular membranes are extremely selective for IA group ions. Excitable membranes, therefore, show the additional property of high ionic selectivity but the converse is not true. Examples of excitable cell membranes are neuronal, cardiac and smooth muscle membranes. The excitability of neuronal cell membranes is of considerable importance in understanding the mechanism of bio-electrical transmission in neuronal tissues. Most of the drugs used for depressing or enhancing the electrical activity of brain act via the excitability parameter as evidenced on the I-V curve determined experimentally. Under a new CSIR research scheme granted to him, Dr S. V. Talekar, Lecturer, Department of Biophysics, National Institute of Mental Health and Neuro Sciences, Bangalore, proposes to isolate and characterize the membrane proteins responsible for the excitability phenomenon at molecular levels. The study will consist of preparation of neuronal cell membranes using repeated density centrifugation; separation and identification of membrane proteins using TLC, IR and NMR techniques; and reconstitution of membrane using the bilayer technique and assay of the separated proteins for electrical excitability using the current-voltage curve. A parallel study of human RBC membranes, electrically non-excitable, will also be mades.

Completed Schemes

X-ray Crystallographic Studies of Rare Earth Nitrate Complexes

The repulsive force between the ligands increases with decrease in the ionic size. This force may increase to such an extent that the structure of the complex may become unstable and the crystal structure may change. A study was made by Dr K. Krishna Bhandary (a CSIR research fellow) under the guidance of Dr H. Manohar at the Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore, to achieve a correlation between the effect of lanthanide contraction with change in coordination number and crystal structure. A series of rare earth complexes, having the general formula $Ln(NO_3)_3 \cdot n(CH_3)_2SO$, where $n=4$ for $Ln=La$ to Gd, and $n=3$ for $Ln=Tb$ to Yb were chosen for this purpose.

The complexes, viz. $La(NO_3)_3 \cdot 4(CH_3)_2SO$, $Yb(NO_3)_3 \cdot 3(CH_3)_2SO$ and $Nd(NO_3)_3 \cdot 3(C_{11}H_{12}ON_2)$, were characterized by heavy atom technique and least squares method. The final *R* indices were found to be 0·094, 0·078 and 0·038 respectively. Photographic intensity data collected by the Weissenberg technique and visually estimated were used for the lanthanum and ytterbium complexes, whereas accurate intensity data collected by an automated diffractometer were used for the neodymium complex.

The lanthanum ion was found to have a coordination number of 10 and the oxygens surrounding the metal ion formed a 10-coordinate C_{2v} polyhedron derived from the dodecahedron. The Yb^{3+} had a coordination number of 9 and the polyhedron was a slightly distorted tricapped trigonal prism. The lowering of the coordination number was attributed to the difference in the sizes of La^{3+} and Yb^{3+}, the latter being smaller. Nd^{3+} in the antipyrine complex exhibited a coordination number of 9 with coordination geometry similar to that of Yb^{3+} in the DMSO complex of ytterbium nitrate. The lower coordination of Nd^{3+} might be due to steric factors, the antipyrine being a bulkier ligand than DMSO.

In order to obtain similar structural information on some of the intermediate complexes in the series of DMSO complexes, crystal data were obtained for the samarium, terbium and thulium nitrate complexes. The samarium complex was found to be isomorphous with the lanthanum complex and had a coordination number of 10. Moreover, the lattice parameters and the molecular volume for the two complexes were practically the same despite the considerable reduction in the size of the Sm^{3+}. The energy of repulsion between the ligands would therefore be greater in the samarium complex than in the lanthanum complex. In the gadolinium complex, one would expect a still higher energy of repulsion between the ligands because of the smaller size of Gd^{3+}. In the terbium complex, the repulsive force is so large that the structure becomes unstable. As a result, one DMSO group is pushed out of the coordination sphere, reducing the coordination number to 9. The complexes of terbium and the succeeding lanthanides were found to be isomorphous with the Yb^{3+} complex. The molecular volume of the terbium complex was found to be nearly 100 A^3 less than that of the lanthanum complex. The decrease is nearly equal to the molecular volume (105 A^3) of DMSO and in fact the complexes of terbium and the following members of the series contained only three DMSO groups as against four in the complexes of the earlier members of the lanthanide series.

Chloroquin Phosphate

Chloroquin phosphate is a well-known antimalarial and antiamoebic drug. It is synthesized by condensing 4,7-dichloroquinoline with Novoldiamine; these intermediates are being imported at present. Synthesis of these intermediates, using indigenously available raw materials, was attempted by Shri V. Y. Nevrekar (CSIR research fellow) under the supervision of Dr V. K. Parameshwaran at the Department of Chemical Technology of the Bombay University.

4,7-Dichloroquinoline was synthesized by the Conrad Limpach synthesis. Oxaloacetic ester was condensed with *m*-chloroaniline to obtain 4-hydroxy-7-chloro- and 4-hydroxy-5-chloroquinoline-2-carboxylates. The isomers were separated by crystallization from pyridine-alcohol mixture. Hydrolysis, decarboxylation and chlorination (with POCl$_3$) of the 4-hydroxy-7-chloro derivative gave 4,7-dichloroquinoline.

For preparing Navoldiamine, Novolid (2-chloro-triethylamine) was condensed with acetoacetic ester in the presence of sodium to obtain the novoester. Hydrolysis and decarboxylation of the novoester in sulphuric acid gave 5-diethylamino-2-pentanone (novolketone). Novolketone was converted to 4-diethylamine-4-diethylamino-1-methylbutylamine (Novoldiamine) by Leukart-Wallach reaction. The two products, i.e. 4,7-dichloroquinoline and Novoldiamine, on condensation in the presence of phenol gave chloroquin, which was subsequently converted to its diphosphate.

Conditions for obtaining optimum yields were standardized.

PATENTS FILED

2441/Cal/74 : Improvements in/or relating to the electrochemical reduction of nitrobenzene to *p*-aminophenol H. V. K. Udupa, K. S. Udupa & K. Jayaraman—CECRI, Karaikudi.

2442/Cal/74 : Improvements in/or relating to anodic phosphating, M. E. K. Janaki, M. Sethukumari, P. S. Mohan, N. Krithivasan, C. Rajagopal, R. Srinivasan & K. S. Rajagopalan—CECRI, Karaikudi.

2760/Cal/74 : A novel method of amplitude modulation for citizens band transreceivers, P. K. Rangole & H. K. Jain—CEERI, Pilani.

2763/Cal/74 : A process for the recovery of silver, barium sulphate and base paper from photographic bromide paper, V. S. Bhaskar Rao, S. A. Athar Rizvi & S. Subrahmanyam—RRL, Jorhat.

112/Cal/75 : An integrated process for the degumming of muga-cocoon and muga waste, A. Majumdar, P. P. Baruah & B. P. Chaliha—RRL, Jorhat.

125/Cal/75 : A multi-exposure high-pressure X-ray powder camera, J. Singh—NPL, New Delhi.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 6/75

It is proposed to appoint a Director to head the National Botanic Gardens, Lucknow.

Job Requirements : It is a top research management post in the domain of economic botany with special emphasis on plants of industrial value and the development and maintenance of botanical gardens in the country. The Director is required to provide high-level leadership in the formulation of research and development programmes and projects, organizing and coordinating team work to secure progress in the attainment of the objectives of the institute. He will have the overall responsibility for the work of the institute and for creating an atmosphere conducive to creative work. The chief functions of the Garden may broadly be stated as collection, introduction and propagation of ornamental plants, botanical, horticultural and phyto-chemical researches on economic plants, maintenance of botanical gardens, setting up of herbaria and botanic museums, specially of economic plants, and identification, supply and exchange of plants and plant materials.

Qualifications/Experience : There is no standard application form prescribed as such. The candidates must provide proof of their academic level, research and development experience and management ability consistent with the fulfilment of job requirements specified above. Scientists/technologists interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research. They can also obtain a brochure on the aims and objects and the latest annual report of the institute.

Salary/Conditions of Service : The salary scale of the post is Rs 2500-125/2-3000. Other conditions of service are as per CSIR rules.

The person selected will be appointed on contract for a period of six years, subject to confirmation of the contract after two years of satisfactory service. Other conditions of contract will be supplied on request.

Age Limit : Below 50 years, relaxable in special cases.

All correspondence in this regard may be addressed to the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001, and the completed *curriculum vitae* proforma must be received in the office on or before 6 August 1975.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

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Research and Industry Get-together : RRL, Jorhat

The Regional Research Laboratory (RRL), Jorhat, in collaboration with the Directorate of Industries, Government of Assam and Assam Small Industries Development Corporation Ltd, Gauhati, organized a Research and Industry Get-together on 3 May 1975 at Gauhati. Attended by a large number of entrepreneurs, industrialists and government officials, the get-together was presided over by Shri C. S. Teron, Minister for Industries, Government of Assam. Developmental problems associated with industries in the region and ways and means of effecting greater rapport between CSIR laboratories and industries were discussed at the get-together.

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, in his preliminary remarks, analyzed in depth the role of scientists, industry and the policy makers of the government. He said that there was an inherent conflict between research and industry as the industry wanted stability, safety and security whereas research leads to change. The Government policy makers, he pleaded, should help provide an atmosphere which would ensure the utilization of research by industry. CSIR was actively interacting with financial institutions and other organizations like the Indian Council of Agricultural Research, the Indian Council of Medical Research, and the Electronics Commission to make an integrated approach to the total research input within the country. CSIR was also interested in setting up polytechnological clinics in every state capital so that the problems of each state could be solved. CSIR endeavoured not only for economic development but also for industrial development coupled with social justice, because technology must be relevant to the needs of the majority of the people, Prof. Nayudamma added.

Shri C. S. Teron, Minister for Industries, Government of Assam, addressing the get-together at Gauhati. Seated on the dias *(from left)* are Shri Baldev Singh and Prof. Y. Nayudamma

Briefly reviewing the work of the laboratory, the Director, Dr G. Thyagarajan, said that the projects of the laboratory were recently re-oriented to suit the needs of the region as well as of the country as a whole. Emphasis had been given to the areas of low-cost housing, beneficiation of minerals, cultivation of medicinal and economic plants, utilization of high-sulphur coal and technology for pesticides, he added.

Shri D. N. Barua, Managing Director, AIDC, Gauhati, said that the consultants should have the national spirit to translate researches into production units. Shri B. P. Goenka from Shillong suggested that the time lag in transfer of CSIR processes should be reduced; presently the entrepreneur is required to enter into a prolonged correspondence with NRDC. Shri Kamath, Managing Director, Assam

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Pharma Co., wanted that CSIR laboratories should offer processes which had been tried at least on pilot plant scale.

While referring to the citronella distillation unit fabricated and erected by RRL, Shri D. R. Dutt, Director of Industries, Government of Nagaland, expressed his desire to know about other crops that could be grown in the area for agro-based industries. He wanted the laboratory to help establish ancillary industries in Nagaland.

Shri Baldev Singh, Chief (Technology Utilization), CSIR, said that while trying a new indigenous technology, support by the government and banking institutions was necessary. CSIR offered processes from bench-scale level on "as is where is" basis to turn-key jobs and it was for entrepreneurs to select processes most suitable to them. He appealed to the industry to establish closer linkage with the CSIR laboratories.

In order to obtain a first-hand knowledge of the needs, problems and aspirations of the north-eastern region and to have a direct dialogue with the top government officials, industrialists and policy makers in these states, the Director General Prof. Nayudamma, accompanied by Shri Baldev Singh, visited Assam, Nagaland, Arunachal Pradesh and Meghalaya. Prof. Nayudamma also inaugurated a 1600 kg grass per day capacity citronella distillation plant in Yaongymsen village (Mokoksang District) and formally transferred it to the Government of Nagaland. The design, fabrication and erection of the plant had been undertaken by RRL on turn-key basis.

NML's Technology Utilized in India's First Sponge Iron Plant

The country's first sponge iron plant with a capacity of 25-30 thousand tonnes per year based on the technology of solid reduction process developed at the National Metallurgical Laboratory (NML), Jamshedpur, was inaugurated by the Union Minister for Industry and Civil Supplies, Shri T. A. Pai, on 2 June 1975 at the plant site of Andhra Cement Co. Ltd, Vijayawada. The Minister congratulated Prof. V. A. Altekar, Director, NML, and his colleagues who had helped in setting up the plant with indigenous technology and skills. Shri Pai expressed the hope that the country's future strategy for steel production would not be based on an integrated approach as in the past, but instead be one of spreading out production activities in a way that steel could be produced within a short period of 2-3 years as against a period of 10-15 years generally taken for putting up an integrated steel plant.

The Minister was glad to note that the sponge iron plant which he was inaugurating had 100% indigenous process design and equipment developed at NML and used non-coking coal, available in abundance. He expressed firm conviction that NML would not only succeed in putting up many such plants in India but also would be able to sell abroad its new technology for producing sponge iron. He pleaded that the various state development corporations should adopt NML process instead of going round the world in search of suitable technology.

The present project, Shri Pai said, was of importance in the country's development since it had a capacity of 4 million tonnes of electric furnace melting capacity, whereas the present availability of scrap would hardly support more than 1.5 million tonnes of production in terms of hot metal, even assuming a more satisfactory power supply. It was therefore essential that sponge iron production should be developed in the country to supplement steel scrap so as to provide the requisite raw material to electric furnaces.

While addressing the gathering, Prof. Altekar said that the sponge iron was obtained by directly reducing iron ore with solid reductant and it could be conveniently converted into steel by melting in an electric arc furnace. The sponge iron produced in the Vijayawada plant had already been converted into steel in a 10-tonne arc furnace at Calicut, he added. He made a special mention of the cost factor for steel production by following the sponge iron route in which case the capital investment requirements approximated to about Rs 1500 per tonne as against Rs 6 to 7 thousand per tonne in an integrated iron and steel plant. Complimenting the authorities of Andhra Cement Co. Ltd for utilizing the NML know-how for putting up the first sponge iron plant in India, Prof. Altekar expressed the hope that the Government would soon liberalize the licensing policy so that many more units could be established shortly to make the country self-reliant in the field of steel production.

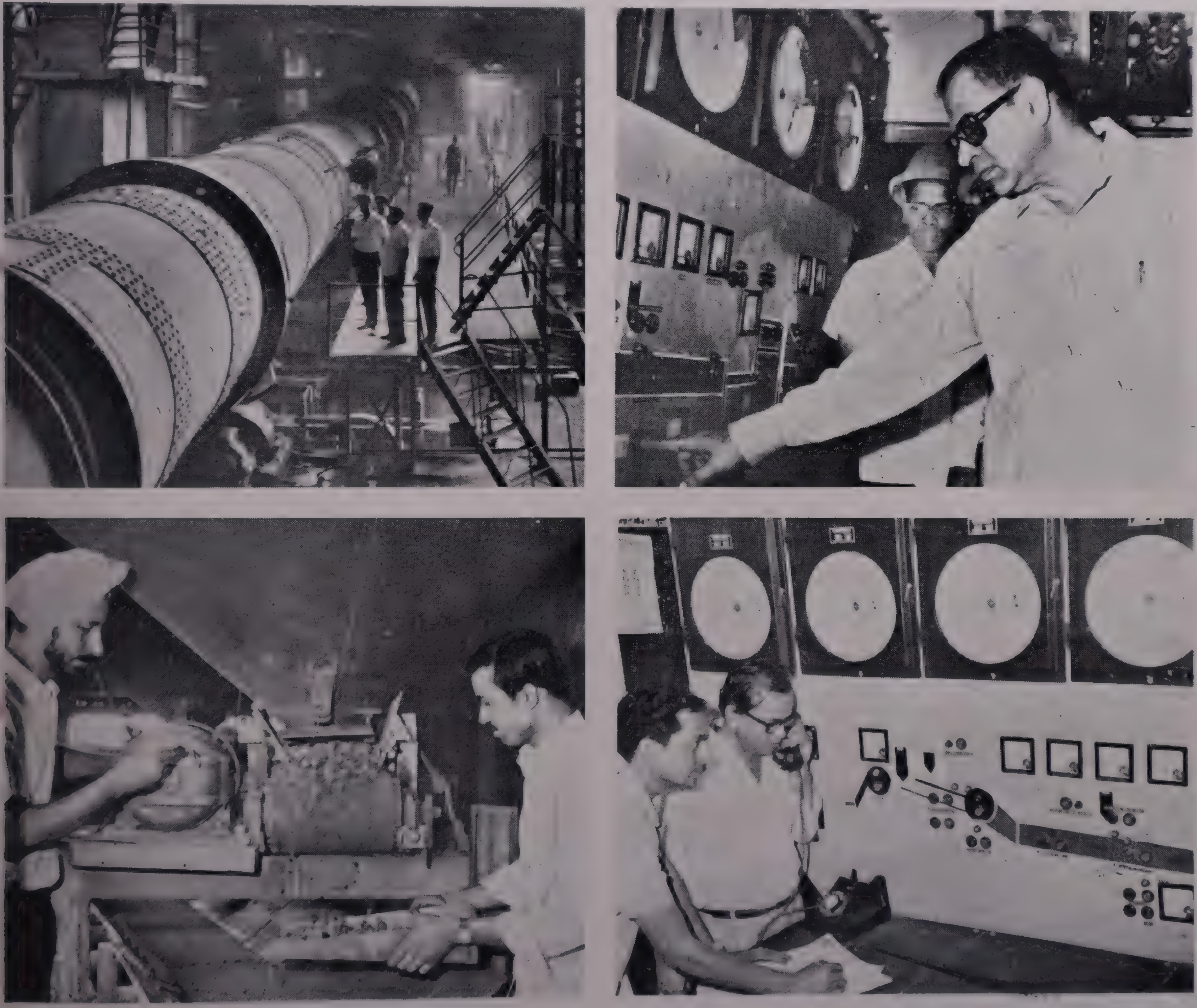
A brief description of the process technique developed at NML is given below.

Process : The technical know-how developed at NML is simple in its concept and can result in a plant that will be easy to operate. Lumpy iron ore/pellets of proper size and non-coking coal of similar particle size are charged into the rotary kiln. A temperature profile of 1000-1100°C is maintained in the reduction zone of the kiln by using producer gas, fuel oil or pulverized fuel. The carbon monoxide produced inside the kiln is also utilized for maintaining the temperature profile with the help of additional air introduced along the length of the kiln. The discharge product is cooled in an air-sealed rotary cooler and the cooled product is subjected to screening and magnetic separation. The sponge iron comes out as a magnetic product and the non-magnetic char is recirculated for better thermal utilization in the process.

Pilot plant work : The NML rotary kiln has a capacity to produce 3-4 tonnes of sponge iron per day. This pilot plant has been working for the last 4½ years and during this period the iron ores and coals from Donimalai, Kiriburu, Bailadila, Surajgarh, Noamundi, Barajamda, Dalli-Rajhara, Gandha ma[illegible]an, Khondobond, Baripada, Ghusghus, Singareni, Talcher, Rampur, Samla and several other places have been used for the production of high-grade sponge iron. The results have indicated that the optimum metallization varies from ore to ore and ranges between 85 and 93%.

Commercial plant : The NML know-how for the production of sponge iron has been successfully transferred to Andhra Cement Co. Ltd, Vijayawada, where a cement kiln of 2.5 m diam and 45 m long has been modified for the production of sponge iron. Recent trials conducted by NML scientists have shown that the sponge iron produced (60-80 tonnes) is more than 90% metallized. Several hundred tonnes of high-grade sponge iron have been produced so far at this plant.

Conversion to steel : The sponge iron produced at NML has also been successfully converted to steel in the 0.8-tonne electric arc furnace at NML and 10-tonne furnace at the Heavy Electricals Corporation, Ranchi, and Bhilai Steel Plant, Bhilai. A decrease in power and refractory consumption in the electric arc furnance was observed when sponge iron was used. An additional advantage of the process is that it could be made continuous by providing a



(*Clockwise from top left*): View of the sponge iron plant (capacity, 25,000-30,000 tonnes/annum) of Andhra Cement Co. Ltd, Vijayawada, based on NML technology; Shri T.A. Pai, Union Minister for Industries & Civil Supplies, inaugurating the plant from the control room; View of the control panel of the plant; Iron ore discharged from the elevator bin into the conveyor belt being checked by NML scientists

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chute for charging the sponge iron continuously into the hearth of the electric arc furnaces. Further trials for converting sponge iron to steel are also under way at Madras and in Kerala.

NML has done extensive work to treat various raw materials of the country for the production of sponge iron, operating the rotary kiln at various parameters to determine the optimum condition required for a set of raw materials. NML can also demonstrate steel production by the use of sponge iron and also undertake the preparation of feasibility reports and help install commercial plants based on rotary kiln technology. The commercial success of sponge iron in the country is expected to lead to the establishment of more sponge iron plants and thereby augment steel capacity in the country.

Economics : Even in the small pilot plant (capacity, 3-4 tonnes per day) the cost of production of sponge iron at NML varies from Rs 400 to 450 per tonne including not only the raw material and direct costs but also depreciation and other overheads. It is estimated that in a 100 tonnes per day capacity plant, which is suitably located with respect to availability of ore and coal, the cost of production of sponge iron may vary between Rs 350 and Rs 400 per tonne. In the context of today's high prices (about Rs 800 per tonne) of high-grade scrap, the cost of production of sponge iron is reasonably low to hold enough margin and incentive.

The entire plant based on the NML know-how can be fabricated in the country without foreign exchange requirement. Investment costs on plants with capacities of 50 tonnes and 100 tonnes per day are likely to be Rs 200 lakh and Rs 350 lakh respectively.

Aluminium Conductors and Cables : Seminar at NML

A seminar on 'Aluminium Conductors and Cables' was organized by the National Metallurgical Laboratory (NML), Jamshedpur, in collaboration with the Cable and Conductor Manufacturers' Association of India, New Delhi, on 13-14 February 1975. The seminar was inaugurated by Shri Chandra Shekhar Singh, Minister for Industries and Technical Education, Government of Bihar. A large number of delegates representing primary aluminium producers, electricity boards, railways, electrical industries, and cable and wire manufacturers attended the seminar.

Prof. V. A. Altekar, Director, NML, while welcoming the delegates, said that NML-PM2 conductors are being enthusiastically adopted by the industry as they have been found to possess significant properties such as better ductility, electrical conductivity, corrosion resistance, and resistance to creep deformation, offering natural advantages in minimizing sag in transmission lines and lessening relaxation of conductor joints.

In his inaugural address, Shri Chandra Shekhar Singh said that NML's development of the electric-grade aluminium alloy conductor, NML-PM2, was a landmark, and would place the country on the threshold of great economic recovery by totally replacing the expensive copper metal as a conducting material. The aluminium alloy conductor could be used in the manufacture of cables and wires, transformer and motor windings, telephone cables, welding cables, household wires, etc. The Minister also made a special mention of the work of NML in ferrous and non-ferrous technologies and appreciated its role in developing the mineral and metal based industries in the Bihar State.

Dr Rajendra Kumar, Deputy Director, NML, in his theme address, observed that the superiority of NML-PM2 over the electric-grade aluminium had been amply demonstrated by large-scale industrial operations. A number of papers from the industry had supported the claims of the laboratory and had shown that it is possible to enlarge the scope of substitution of copper by using NML-PM2. He further stated that the use of NML-PM2 would increase the operational efficiency of the crimp joints as the alloy has very good anti-relaxation properties.

Sixteen papers were presented and discussed in three technical sessions. In one of its recommendations, the seminar urged the government to assist NML in developing the alloy further for use in the manufacture of cables and conductors on a large scale and to take steps for the manufacture of larger quantities of electrical winding wires progressively for use in the production of motors and transformers, control cables, flexible wires and for fine wire applications, which would considerably cut down the import of copper. It also called for standardization of the sizes and types of conductors and conductor accessories to be used in the transmission and distribution system so that transmission losses could be avoided.

The NML technology for aluminizing of steel wires could also be utilized in collaboration with state electricity boards for the production of experimental quantities of ACSR wires using aluminized steel core. This work could be done in consultation with the Central Water and Power Commission.

Since connectors are an integral part of any electrical transmission and distribution systems and since many failures had been noted at such points, it was recommended that the R & D facilities at NML might be utilized for developing good and satisfactory connectors.

REPRODUCTIVE PHYSIOLOGY

Bhatnagar Prize-winner Prof. Guraya's Work

Prof. Guraya's researches during the last 17 years have thrown new light on several fundamental questions of the comparative reproductive biology of vertebrates. Some of these problems concern developmental processes during gamatogenesis, difference between normal and atretic follicles, causes of follicular atresia, changes occurring during ovulation and luteinization of granulosa

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Prof. S. S. Guraya has been selected for th Shanti Swarup Bhatnagar Prize in biologica sciences for the year 1973 (jointly with Dr B R. Murty). Presently he is Head of the Zoology Department of the Punjab Agricultura University, Ludhiana.

[illegible]is, nature of hormonal factors controlling the life of corpus luteum, sites of steroid hormone synthesis in the ovary of vertebrates, factors controlling the steroidogenesis, and physiology of human ovary during various reproductive states.

Guraya has observed that human primordial oocytes become aged in terms of somatic cell life and this might be one of the major factors causing abnormalities in children born to old women.

Prof. S.S. Guraya

Substances contributed by the follicle cells to the growing oocyte have been shown to comprise phospholipids, glycogen, nucleoproteins, etc., the infiltration of which into the growing oocyte is accompanied by conspicuous nuclear and ooplasmic changes. The intense activities of hydrolytic enzymes in the wall of follicle are related to the transfer of nutrient substances across cellular membranes.

Investigations made for determining the sites of hormone synthesis in the growing follicle of mammalian ovary have revealed that the theca interna cells *in vivo* constitute the site for oestrogen synthesis.

Researches of Guraya, as well as of Espey and coworkers, on the mechanism of ovulation have shown that the rupture of a follicle is the result of a series of definitive degraded changes in the wall of follicle, which are brought about by hydrolases.

Studies on the characterization of complex processes of cytoplasmic differentiation, which occur during the transformation of granulosa cells into luteal cells after ovulation in the mammalian ovary, have led to the conclusion that the appearance of abundant, diffusely distributed lipoproteins during the transformation of granulosa cells into luteal cells in several mammals, including human, can serve as a useful histochemical indicator of this process not only in the granulosa lutein cells but also in the other steroid-secreting cells, viz. theca lutein, theca interna, and interstitial gland cells. The steroid-secreting cells also develop abundant diffuse lipoproteins (membranes of smooth reticulum) and enzyme activities indicative of steroidogenesis. Correlated cytological, histochemical and biochemical studies have shown that the cells of corpus luteum undergo drastic metabolic alterations in relation to steroidogenesis during their life span in different reproductive states, which are the result of changes in the amount and nature of endogenous gonadotrophins.

The granulosa lutein cells of post-ovulatory follicles (or corpora lutea) of sub-mammalian vertebrates have been shown for the first time to develop the cytological, histochemical and biochemical features of mammalian corpora lutea.

Follicular atresia has been shown to be a widespread degenerative phenomenon in the ovaries of mammals and non-mammalian vertebrates by which a majority of oocytes at various stages of development are lost besides through ovulation. Guraya's researches have shown that its most important cause is the lack of proper endogenous gonadotrophic stimulation. Conspicuous morphological, histochemical and biochemical alterations occur in the various components of the follicle during atresia, which are related first to the disruption of normal interrelationships among the various components of the follicle and then to their digestion and resorption. Corpora atretica of sub-mammalian vertebrates have been shown not to perform any endocrine function as they are merely mature eggs in the process of resorption. The most important physiological significance of follicular atresia was found to be the building of steroidogenic tissue from the theca interna and surrounding stroma of atretic follicles and consequently of the steroid hormones secreted by the ovary. Guraya has clearly demonstrated the presence of such a tissue also in the ovaries of non-mammalian vertebrates. It was also suggested by him that the secretory products of interstitial gland cells of thecal origin are of great physiological significance in the initiation of puberty and cyclic ovarian activity.

Guraya has also made specific contributions to the physiology of human ovary. The corpus luteum is a functioning endocrine organ throughout gestation although its secretions may not be essential in late gestation.

The drop in oestrogen production after the ovulatory peak has been attributed to a sudden change in the metabolism of cholesterol-containing lipids in the theca interna cells as they begin to function in the storage of hormone precursor rather than in secretion of oestrogen.

The formation, morphology and chemical nature of residual bodies and other structures in the seminiferous epithelium of reptiles, birds and mammals are basically similar. However, the testis of teleosts does not show any appreciable development of residual bodies seen in the testis of amniotes. Guraya has shown the existence of a close parallelism in the distribution and localization of lipids and enzymes during the spermatogenic wave in amniotes.

Studies made by Guraya, as well as by Lofts and coworkers, have shown that the Sertoli cells of amphibian testis and lobule boundary cells of fish testis form an equally important source of steroid hormones. The various steroid gland cell species of vertebrate testis and ovary have been shown to possess similar cytological, histochemical and biochemical features,, indicating that the sub-cellular basis of steroidogenesis is very similar in them. This finding is of great significance in the field of comparative endocrinology.

The respective contributions of the acrosomal vesicle and granule to the acrosomal cap of spermatozoa in vertebrates have been shown to vary greatly. It was suggested that these differences must be related to the thickness and chemical composition of egg coverings which are dissolved by the acrosomal lysins of penetrating spermatozoa. The acrosomal cap (acrosome) is not formed in teleost fish spermatozoa and this is related to different modes of spermatozoal entry into the fish egg.

Correlative histochemical and ultrastructural observations on the mitochondria during spermiogenesis of mammals have shown that they gradually store lipids (phospholipids) which might be the chief source of oxidative energy during the passage of spermatozoa through the male ductular system. Guraya has also demonstrated that the mammalian spermatozoa show conspicuous variations in their lipid contents.

EVOLUTIONARY DIVERGENCE IN CROP PLANTS : FUNDAMENTAL GENETICS

Bhatnagar Prize-winner Dr Murty's Work

Dr B. R. Murty has made outstanding contributions in genetics, including radiation genetics, cytogenetics, plant breeding, statistics and evolution. His research contributions pertain to a unique combination of genetics, statistics and cytogenetics with productivity, and these have contributed to new schools of thought in different fields such as evolutionary divergence of biological populations by distance analysis, canonical and factor analyses, selection methodology, mutation breeding, cytogenetic regulation of recombination, and basic studies and also to the use of nuclear tools for detecting and overcoming crossability barriers and divergence in species and mechanisms of morphogenesis. The School of Biometrical Genetics created by him at the Indian Agricultural Research Institute, New Delhi, has won international acclaim.

Dr B. R. Murty

In fundamental genetics, his major contributions are in the field of multivariate analysis in the assessment of genetic divergence in biological populations; changes in components of variance in relation to breeding systems; genetics of adaptation in food crops; disruptive selection for crop improvement and the genetic regulation of recombination in wheat, *Pennisetum* and *Brassica*. He has also contributed to mutation breeding for disease resistance, and to theoretical studies for improving the efficiency of designs for estimating genetic parameters in plant breeding. He established for the first time the relation between the changes in the regulation of recombination with the genetic load and fitness in crops with diverse breeding systems and evolved a new theory, accepted internationally, on the changes in chiasma frequency under inbreeding. His work on the disruptive selection has resolved an international controversy about its role in creating divergence and release in variability, and an application of such a study has resulted in two improved varieties of mustard. He has also shown that genetic load, as a major factor, is related to fitness and has a regulatory role on chiasma frequency and release of variability. His basic studies, emphasizing on selection for development traits, in both self- and cross-pollinated crops have been accepted by the International Atomic Energy Agency in the simultaneous improvement of yield, grain quality, and disease resistance, and have also modified the concept on the stage of selection and the relative importance of selection for specific attributes. A new approach to study evolutionary trends in biological populations has been established by improved biometrical criteria. He has created a new school of thought utilizing multivariate analysis, including factor analysis, for the assessment of genetic divergence in crops with different breeding systems. His work on cataloguing and classifying genetic stocks of world collection and the information retrieval system have been used as a model for all crops by FAO and the International Atomic Energy Agency.

As Coordinator of the All India Millet Improvement Project, he was responsible for the release of four hybrids of pearl millet, three of new male steriles, three varieties of ragi and two varieties of *Setaria* for all India cultivation.

As a Director of FAO/SIDA Training Programme, he conducted multidisciplinary training programmes of crop improvement with relevance to the countries of Africa, Asia and Latin America in wide-ranging environments in the production of maize, sorghum and millets.

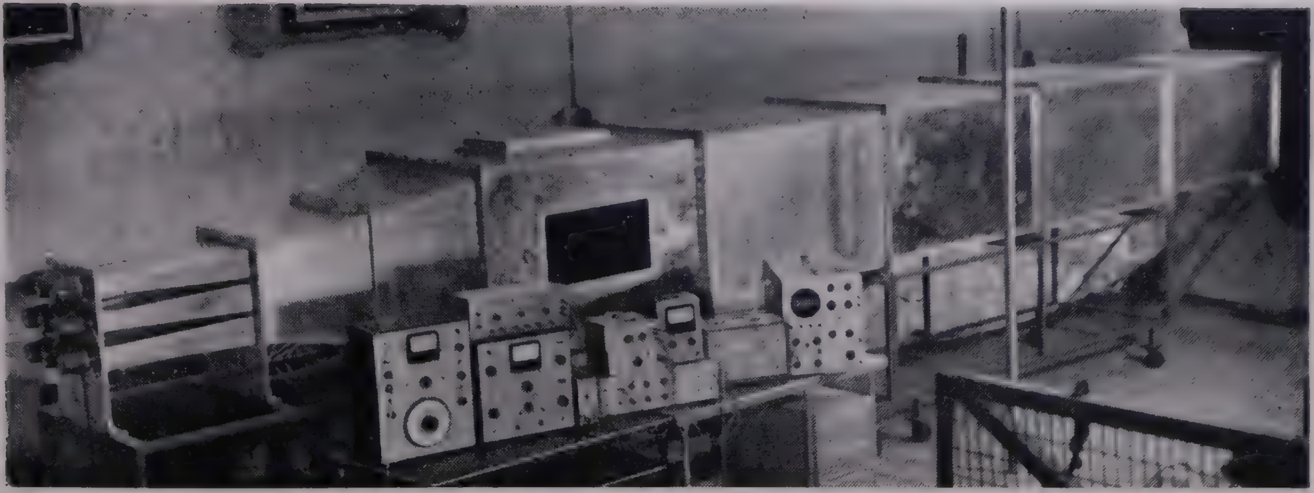
His work in crop improvement has been on diverse crops like cereals (wheat, barley, sorghum and millets), oilseeds (*Brassica*, soybean, groundnut and linseed) and industrial crops like tobacco and cotton.

Dr Murty has been selected for the Shanti Swarup Bhatnagar Prize in biological sciences for the year 1973 (jointly with Prof. S. S. Guraya) [*CSIR News*, **25** (1975), 72]. He is at present Director of Nuclear Research Laboratory, Indian Agricultural Research Institute, New Delhi.

Acoustic Testing Facility Designed at NAL

An acoustic testing facility has been designed and developed at the National Aeronautical Laboratory (NAL), Bangalore. This facility provides a very versatile capability for conducting vibro-acoustic tests on scaled structural models of aerospace vehicles in high-intensity noise environment. It has been designed not only to accommodate scaled models of aerospace vehicles but also to provide the flexibility of performing acoustic tests on vehicle sections or subsystems. It is also possible to carry out acoustic qualification tests on electronic equipment and other spacecraft hardware. Response studies on typical aerospace structures subjected to a random pressure field can also be carried out in this facility.

The acoustic facility employs a progressive-wave mode of acoustic excitation and has a duct system designed to meet this requirement. In progressive-wave tests, a field of plane wave acoustics propagating along the duct passes over the test specimen surface, allowing variation of the overall sound pressure level axially along the test article. The



[illegible]oustic testing facility designed and developed at the National Aeronautical Laboratory, Bangalore

waves are then allowed to be absorbed in the anechoic termination. Sound energy is supplied by nine noise sources, or driver units, which are driven by power amplifiers. The utilization of nine independently controlled and programmable noise sources enables the accomplishment of the simulation of typical random pressure spectra at the test section. An overall sound pressure level of 150 dB can be achieved by using the available capacity of the noise sources. The progressive-wave duct houses the test section and the mountings. The test section has an overall length of 3 ft, width of 27 in., and a height of 27 in. An anechoic termination is located at the end of the duct to ensure that a plane-wave condition is maintained.

Preliminary experiments have been conducted to establish the constancy, repeatability and stability of the pressure spectra for the sound field at the test section. Performance characteristics of various sections of the testing facility have been studied. Developmental experiments conducted to study the feasibility of simulation of a prescribed pressure field have indicated that a wide variety of pressure spectra could be generated by programming the inputs to the driver units.

The laboratory has also developed special-purpose filters, high-gain low-noise dynamic strain preamplifiers and a power spectral density analyzer with automatic frequency sweep over the frequency range of interest. The acoustic testing facility is also adequately supplied with other instrumentation for response measurements.

CSIR Support To Research

New Schemes

Mutagenicity of Caffeine and its Derivatives

Caffeine is a suspect mutagen, as, like xanthine, it may be incorporated as a base analogue and thereby bring about base pair transition mutation. Caffeine is reported mutagenic in bacteria and plants. Similarly, the mutagenic effect of caffeine on *Drosophila* has been reported. Some workers have observed the mutagenicity of caffeine in human cell cultures, whereas others failed to see any mutagenic effect of caffeine in mammalian systems. According to Ostertag [*Mutation Res.*, **2**(1966), 249], caffeine "is the most dangerous mutagen in man". As caffeine is present in most of the soft drinks and coffee, there is urgent need for studying the mutagenicity of caffeine in great detail.

On the other hand, caffeine itself may not be mutagenic but its metabolites and derivatives may be effective mutagens, as it has been shown that some known chemical carcinogens are not mutagens *per se*, whereas their metabolites are able to mutate their target cells. Practically no work has been done on the mutagenicity of caffeine derivatives, although a number of these derivatives are used in various drugs as pain killers. These derivatives, as such, should also be tested for mutagenicity.

Some of the base analogues are not incorporated in DNA but bind with DNA molecules and bring about condensation of DNA helices. An alteration in the cell physiology is caused thereby. A condensation of interphase chromatin in caffeine-treated cells has been reported. Caffeine inhibits RNA synthesis also. Failure of cytokinesis in caffeine-treated cells is a well-known fact. In a new CSIR research scheme granted to him, Dr Sibdas Ghosh of the Chromosome Research Centre, Department of Botany, Calcutta University, Calcutta, proposes to study the effect of caffeine and its derivatives on cellular physiology, particularly on the macromolecular synthesis, along with their mutagenicity to get a clear understanding of the action of caffeine.

Completed Schemes

Mechanism of Cell Adhesion

Reaggregation of mechanically disaggregated 8-day old chick embryonic liver and kidney cells was studied by Shri John V. George, a CSIR research fellow, at the Department of Zoology, University of Delhi, Delhi, in order to measure cellular adhesiveness. Depletion of single cells in the population was found to be parallel with the formation of 2-cell aggregates up to 3 hr, and the reaggregation process could be considered as a second-order reaction in the initial stages. Using the equation for second-order chemical kinetics, the rate of reaggregation was calculated. Statistical analysis of the results showed that the rates of reaggregation of kidney and liver cells were significantly different. Further direct evidence was obtained to show that the rate of reaggregation was dependent on the total number of collisions occurring in the agitated suspension over a given period of time and on the collisions which were effective in making an adhesive bond between the cells. If the total number of effective collisions altered, the rate of reaggregation also showed a concomitant change.

Effects of temperature, chelating agents and metabolic inhibitors on the reaggregation were investigated. It was observed that low as well as high temperatures inhibited reaggregation. But the rate of reaggregation was not inhibited over the range 24-37°C, suggesting that temperature inhibits reaggregation independently of its action on cell metabolism. Both liver and kidney cells showed the same pattern of temperature dependence. It has been suggested that low temperature inhibits cell reaggregation by its ability to arrest the formation of cell surface pseudopodial protrusions.

Contrary to the general belief about the importance of calcium and magnesium in cell aggregation, it was found that cells could reaggregate in a calcium- and magnesium-free medium. Presence of chelating agents like EDTA or citrate in the reaggregation medium prevented the reaggregation completely. The rate of reaggregation was found to be similar to that of control cells on removal of the chelaters. This gives the impression that calcium and magnesium probably occurring at the cell surface are important in cell adhesive mechanism.

Reaggregation proceeded normally, and the rate of reaggregation was identical to that of control cells even if RNA and protein synthesis of the cells was blocked. Similarly, metabolic inhibitors like dinitrophenol, sodium azide, rotenone or glucosamine did not inhibit cell reaggregation.

It was also observed that sulfhydryl (—SH) groups were important in cell adhesion. Aggregation of chick embryonic liver and kidney cells was completely abolished by a treatment with carboxypyridinedisulphide (CPDS) which binds —SH groups. This effect could be reversed by a subsequent treatment with some thiols. Cleland's reagent, a dithiol, failed to reverse the effect of CPDS. Nitropyridinedisulphide also prevented cell reaggregation. The presence of certain thiols in the reaggregation medium was found to be inhibitory. Kidney and liver cells showed certain similarities and certain differences in their response to the presence of thiols in the reaggregation medium. The sulfhydryl groups possibly located at the cell surface stand as the only group with positive evidence for its involvement in cell adhesive mechanism.

These observations indicate that the cell adhesive mechanism is a physicochemical process independent of the cell metabolism but dependent on the surface chemistry of the cell, possibly involving the sulfhydryl groups and divalent cations.

Shri John was awarded the Ph. D. degree for his thesis based on the studies.

PATENTS FILED

2552/Cal/74: A novel electrolytic cell for anodic oxidation of conductors/semiconductors, B.D. Tyagi & S.K. Bhatnagar—CEERI, Pilani.

2761/Cal/74: Flame-resistant bitumen, S.R. Dutta Choudhury, V.S. Bhaskar Rao, A.C. Khanzanchi & B.P. Chaliha—RRL, Jorhat.

2762/Cal/74: Development of a process for the utilization of fly ash for making fire-clay range of products, P.K. Jena, B.S. Mohanty, B.C. Swain & H. Dash—RRL, Bhubaneswar.

2764/Cal/74: Improvements in or relating to a system for obtaining silicon epitaxial layers of constant resistivity by evaporating uniform vapour composition of liquid dopants mixed with silicon halides, P.D. Vyas, B.B. Dixit & K.S. Balain—CEERI, Pilani.

2830/Cal/74: Improvements in or relating to utilization of ferric chloride as a reagent for the extraction of nonferrous metals like nickel, cobalt, copper, zinc, manganese and the like from their oxidic ores, T.K. Rao & P.K. Jena—RRL, Bhubaneswar.

2831/Cal/74: Improvements in or relating to the soak cleaning of steel contaminated with oil, K. S. Rajagopalan, R. Srinivasan, C. Rajagopal, N. Krithivasan, P.S. Mohan, M. Sethukumari & M.E.K. Janaki—CECRI, Karaikudi.

32/Cal/75: Improvements in or relating to sintered porous metal electrodes containing silver catalysts for use as oxygen electrode in low-temperature hydrogen-oxygen fuel cell, V.K. Venkatesan, H.V.K. Udupa, K.S. Arumugasamy Gnanasekharan, R.S. Pattabiraman, T.R. Jayaraman, C. Janaki Amma Indira & R. Chandrasekaran—CECRI, Karaikudi.

PERSONNEL NEWS

Shri B.S. Sharma, Under Secretary, CSIR Headquarters, New Delhi, took charge, on promotion, as Administrative Officer (Selection Grade), National Metallurgical Laboratory, Jamshedpur (30 April 1975).

Shri I. N. Mathur, Administrative Officer, NML, proceeded on leave (30 April 1975) preparatory to retirement.

Shri J.R. Wadhwa, Accounts Officer, Regional Research Laboratory, Jammu-Tawi, took charge, on transfer, as Accounts Officer, Publications & Information Directorate and Indian National Scientific Documentation Centre, New Delhi (3 July 1975).

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CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

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CSIR Sets up Civil Engineering Consultancy Service (CECON)

A Civil Engineering Consultancy Service (CECON) has been set up under the Council of Scientific & Industrial Research. CECON will be a consortium of six national laboratories of CSIR, namely the Central Building Research Institute (CBRI), Roorkee, the Central Road Research Institute (CRRI), New Delhi, the Structural Engineering Research Centre (SERC), Roorkee, the National Environmental Engineering Research Institute (NEERI), Nagpur, the Cement Research Institute of India (CRI), New Delhi, and the National Botanic Gardens (NBG), Lucknow.

The objectives of CECON are as follows :

(i) To undertake civil engineering consultancy assignments with a view to providing effective utilization of R & D work of CSIR laboratories;

(ii) To maximize the utilization of the research results emanating from CSIR laboratories in the civil engineering construction programmes of CSIR and its constituent laboratories;

(iii) To provide international consultancy services in civil engineering, especially to developing countries; and

(iv) To function essentially as a consultant's consultant.

CECON will be a technical unit of CSIR and the affairs of CECON will be managed by a board of directors consisting of the directors of the abovementioned six laboratories with the Chief Executive Officer as secretary to the board. The chairman of the board of directors will be nominated by the Director General, Scientific & Industrial Research, by rotation every two years, from among its members. The Chief Executive Officer will be appointed by the Director General.

To accomplish the above-mentioned objectives, CECON will seek and undertake consultancy projects in the country and abroad through the constituent laboratories.

CECON will not, however, normally undertake construction of any projects.

The civil engineering construction programmes of CSIR and its laboratories will be referred to CECON for examination by the board of directors for advice on maximum inputs with reference to the results of R & D work of the laboratories before the planning of the projects is undertaken. The Civil Engineering Unit of CSIR will, however, continue to be the executive unit for the construction of CSIR projects under the direction of the Principal Engineer Officer. As far as planning and designing aspects are concerned, the Principal Engineer Officer will seek the guidance and direction of CECON. The facilities in the Civil Engineering Unit will also be available to the Chief Executive Officer of CECON. The board of CECON will advise the Director General in regard to the plans, programmes and progress of the Engineering Unit.

Dr Bh. Subbaraju, Director, Central Road Research Institute, New Delhi, has been nominated chairman of the board of directors of CECON, and Shri T. K. Natarajan, Scientist, CRRI, New Delhi, will be the Chief Executive Officer for the term 1975-77.

The Chief Executive Officer will be delegated adequate administrative and financial powers for effective discharge of duties. For the present, the office of the Chief Executive Officer will be located at CRRI, New Delhi.

Sanction has been accorded to the expenditure of an amount not exceeding Rs 3·00 lakh to be incurred over a period of four years to meet the deficit, with the stipulation that CECON will become self-sufficient by the end of this period.

CSIR's Science Journal in Urdu Released

At a largely attended function held at Rashtrapati Bhavan, New Delhi, on 20 June 1975, the President of India, Shri Fakhruddin Ali Ahmed, released the inaugural issue of *Science ki Duniya*, a quarterly popular science journal in Urdu being published by the Council of Scientific & Industrial Research.

Releasing the issue, the President said that there was a time when India was the Mecca of science and scholars from foreign countries used to visit the country for scientific studies. Under alien domination the lead that the country had established in science was lost. However, during the last two decades this lag in science had been reduced by Indian scientists and technologists whose contributions are now comparable to those of their counterparts in the developed countries, the President said. He, however, stressed the need for making the layman aware of the benefits of science and technology. The President was confident that *Science ki Duniya* would play a leading role in disseminating science to the common man. Shri P. N. Haksar,

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Vice-President, CSIR, also emphasized the need for a popular science journal of this type.

Shri A. N. Mulla, MP, and Chairman, Urdu Advisory Board of CSIR, stressed the importance of science teaching in Urdu at higher levels to create scientific temper in the country.

The editor of *Science ki Duniya*, Shri A. M. Zutshi Gulzar, gave a brief account of the journal [*CSIR News*, **24** (1974), 49].

The first issue of the journal contains articles from eminent scientists and industrialists. Some of the important topics included are : Interaction between science and culture in India (A. Rahman); Coal as a source of energy and chemicals (G. S. Sidhu); Development of new flowers (T. N. Khoshoo); Role of water in treatment (Nasim Ansari); Elements—new and old (R. C. Mehrotra); Shortage of energy in India (S. Husain Zaheer); Innovation in small-scale industries (D. H. Malik); and Science and technology in the fifth Five-Year Plan (M. R. Raman).

The Advisory Board for the journal consists of eminent scientists, educationists, scholars and industrialists with Shri A. N. Mulla, as Chairman, and Shri A. M. Zutshi Gulzar as Editor and Secretary, under the guidance of Prof. A. Rahman as Scientist Guide. Other members of the board are : Dr S. Husain Zaheer, Prof. A. A. Saroor, Dewan Anand Kumar, Dr Swaroop Singh, Dr Nagendra, Hakim Abdul Hamid, Shri Maheswar Dayal, Shri A. J. Kidwai, Prof. Rais Ahmed, Prof. R. C. Mehrotra, and Dr (Mrs) S. Iyengar.

The President Shri Fakhruddin Ali Ahmed releasing the Urdu journal *Science ki Duniya*. Seen with him (*from left*) are Shri A. N. Mulla, Shri A. M. Zutshi Gulzar (receiving the journal) and Prof. A. Rahman

The quarterly is priced Re 0·50 per copy, and the annual subscription is Rs 1·50. Further details can be had from : The Editor, *Science ki Duniya*, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001.

TRANSCRIPTION PROCESS IN HIGHER ORGANISMS

Bhatnagar Prize-winner Prof. Biswas' Work

Prof. Biswas

The work of Prof. Biswas over the last five years centred round (i) regulation of RNA and protein synthesis in the cell, particularly plant cell, in order to understand the control mechanism in the higher organisms, and (ii) metabolic cycle involving inositoi phosphates during the formation and germination of seeds. The studies have opened up new vistas in the field of transcription process in higher organisms as well as in the regulation of some of the enzyme functions in relation to biosynthesis of inositol phosphates.

Multicontrol system in transcription process in higher cells

RNA synthesis by RNA polymerase has been amply elucidated in bacterial systems. Owing to some inherent difficulties, RNA polymerase from higher organisms could not be purified. Since chromatin is complex, additional insights might be obtained from higher organisms. Biswas and coworkers have isolated and purified two RNA polymerases (CI and CII) and several protein fractions (A, B and C) from the chromosomal acidic proteins of coconut endosperm nuclei. Fraction B has been implicated as the initiation factor on the basis of experimental evidences. Fraction C seems to facilitate the release of synthesized RNA from the DNA template without influencing the

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Prof. B. B. Biswas, Bose Institute, Calcutta, has been selected for the Shanti Swarup Bhatnagar Prize in Biological Sciences for the year 1972 (jointly with Dr S. C. Maheshwari of the Delhi University) [*CSIR News*, **25** (1975), 72].

molecular size of RNA synthesized. On purification through QAE Sephadex on polyacrylamide gel electrophoresis RNA polymerase CI exhibits a single band nearer to cathode end. However, when electrophoresed in gels with 0·1% SDS, CI tends to be dissociated into four bands, designated as a, b, c and d. Further experimental evidence has been adduced to show that one molecule of factor B is associated with one molecule of RNA polymerase to form an initiation complex at the DNA site.

That indoleacetic acid (IAA) can influence nucleic acid synthesis in plant cells has been reported from a number of laboratories. However, the actual mechanism of IAA on RNA synthesis by isolated RNA polymerase system is yet to be elucidated. Addition of IAA to RNA polymerase CI and factor B system does not influence the reaction. Another protein fraction, isolated from nuclei and purified to homogeneity, can bind IAA, thus forming a complex. When this complex was added to RNA polymerase system, 2-3 fold stimulation of RNA synthesis was recorded. The various possibilities of the mechanism of action of IAA on the RNA polymerase are : (1) IAA-acceptor protein modifies the initiation by interacting with the factor B; (2) it may interact with RNA polymerase; or (3) with DNA so that the factor B can now initiate RNA synthesis from that protein of DNA which otherwise cannot interact with RNA polymerase or factor B *per se*. However, when the binding of IAA acceptor protein with DNA was studied by passing the complex through membrane filter, it was noted that DNA could interact with IAA protein complex in the absence of RNA polymerase and factor B. That the RNA synthesized in the presence of IAA acceptor protein complex is different from that of the control has been shown by hybridization of RNA with DNA as well as by electrophoretic separation of RNA species. All these observations suggest that the action of IAA is mediated through an acceptor protein; and IAA and acceptor protein form a complex with DNA at some specific site. The initiation factor and RNA polymerase interact with these sites and form initiation complexes. RNA synthesis does not seem to occur at these sites in the absence of IAA acceptor protein. Interaction of abscisic acid a plant growth retardant, with DNA increases the stability of double strand against heat or alkaline denaturation. Abscisic acid in RNA polymerase systems isolated from the chromatin of coconut nuclei inhibits RNA synthesis by lowering the template activity of DNA. No interaction with RNA polymerase or initiation factor is discernible. These observations suggest that there are multicontrol elements in the regulation of transcription process in eukaryotic cell and this seems to be more complex than envisaged earlier.

Mature chicken erythrocytes contain nuclei which are nonfunctional in terms of DNA and RNA synthesis. The primary interest was to find out the cause for the loss of transcriptional activity in chicken erythrocyte nuclei. From the experimental data it is clear that the absence of initiation factor may be one of the causes for the loss in transcriptional activity in those nuclei.

Translational and other controls in plants

Germination is an irreversible process in which a number of simultaneous events takes place shortly after inhibition of water by the seeds. That the entire apparatus necessary for protein synthesis is functional in the cotyledon of ungerminated peanut and that messenger RNA is limiting have been shown by different workers. Thus far it has tacitly been assumed that no informational factors other than mRNA operate between DNA and protein. The question arises whether there is any change in the ribosomes during the different stages of germination. 80S particles isolated from 6-hr soaked cotyledons and subjected to dialysis in the absence of Mg^{2+} show partial resistance to dissociation into 60S and 40S subunits. The older the cotyledons the more readily are its ribosomes dissociated. It is noteworthy that the protein components of the 80S particles from cotyledons show the presence of two slow-moving bands which are not detected in the root. The possibility might exist that ribosomal function in the cotyledon is associated with the deletion of specific protein components.

The degradation of phytin (inositol hexaphosphate) in germinating mung bean seeds has been found to be associated with the increased activity of phytase in the cotyledon. This phytase increase is dependent on the synthesis of new RNA in the cotyledon, suggesting a transcriptional control of phytase. An enzyme, phosphoinositol kinase, has been isolated and purified from mung bean seeds. It is not detected in ungerminated seeds but appears in the cotyledons after soaking. It appears that the enzyme is inactivated by an inhibitor which is being synthesized during the ripening of seeds. During germination this inhibitor protein is gradually degraded. The nature of the phosphoinositol kinase inhibition by the inhibitor has been found to be non-competitive. Another novel enzyme, GDP-inositol hexaphosphate phosphotransferase, has been reported from the germinating mung bean seeds. This is a unique process in generating GTP from GDP since in inositol hexaphosphate there is no pyrophosphate group or high-energy phosphate group. It is apparent that for the metabolism of phytin in the seeds, different control systems are operative. A metabolic cycle has now been proposed whereby glucose-6-phosphate is converted to inositol-1-phosphate and subsequently to inositol hexaphosphate during the formation of seeds. At the time of germination, inositol hexaphosphate donates one of its phosphates to either ADP or GDP through an enzyme synthesizing ATP or GTP and inositol pentaphosphate, which in turn is converted to inositol-1-phosphate by phytase and subsequently converted to G-6-P by the reverse reaction of cycloaldolase. Three of the enzymes involved in this cycle have been discovered in this laboratory.

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MASS TRANSFER WITH CHEMICAL REACTION AND MASS TRANSFER CHARACTERISTICS OF FLUID-FLUID CONTACTORS

Bhatnagar Prize-winner Prof. Sharma's Work

Prof. Sharma's researches over the years have been of industrial importance and concerned with mass transfer with chemical reaction and mass transfer characteristics of fluid-fluid contactors.

Prof. Sharma

He has carried out a detailed study of the kinetics of gas-liquid and liquid-liquid reactions where the chemical reaction is accompanied by mass transfer, viz. oxidation of cuprous chloride, dithionite and aldehydes; absorption of isobutylene in aqueous H_2SO_4; alkylation of phenols with isobutylene; and reactions between CS_2 and aqueous amines, cyclohexanone and hydroxylamine sulphate. All these reactions are of industrial relevance. A simple method of studying kinetics of fast reactions has also been devised by him.

Sharma and coworkers have devised novel methods for measuring interfacial areas; in particular, they have pioneered the chemical method for measuring effective interfacial area in the case of liquid-liquid systems.

A paper on the study of simultaneous absorption of two gases accompanied by chemical reactions, published in the Transactions of the Institution of Chemical Engineers (UK), in 1971, was adjudged the best paper of the year and the Moulton Medal was awarded to Sharma and his coworker (P. A. Ramachandran).

The importance of diffusional factors on the selectivity of fast consecutive gas-liquid reactions has been studied theoretically and experimentally. This is of particular relevance in the area of substitution chlorination of organic compounds, alkylation of aromatic substances, etc.

Gas absorption in a slurry containing sparingly soluble fine particles has also been studied by Sharma. The study has revealed that the simultaneous dissolution of fine particles in the diffusion film can augment the specific rate of absorption by a factor of as much as 5. This is industrially relevant for cases like absorption of CO_2 in a suspension of lime, and absorption of dilute SO_2 in a suspension of limestone.

Sharma and coworkers have made investigations on the design of mass transfer equipment, viz. bubble columns, mechanically agitated gas-liquid and liquid-liquid contactors, and air-agitated liquid-liquid contactors. Rational procedures for the design and scale-up of these equipments have been suggested.

Prof. M. M. Sharma has been selected for the Shanti Swarup Bhatnagar Prize in Engineering Sciences for the year 1973 [*CSIR News*, **25** (1975), 72]. He is presently Professor of Chemical Engineering, Department of Chemical Technology, Bombay University, Bombay.

Survey of Fuel Oil Requirements in Glass-melting Furnaces

With a view to helping the country to meet the situation arising from the present energy crisis, the Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has been making concerted efforts aimed at efficient utilization of fuel oil in the glass industry. As part of this effort, a survey of the fuel oil requirement in glass-melting tank furnaces was undertaken at the request of the All India Glass Manufacturers' Federation. About 40 glass factories in the different regions of the country were visited for collecting comprehensive data regarding oil consumption in the glass industry vis-a-vis factors which have a direct bearing on oil consumption, like types of furnaces, their design and operation, insulation and instrumentation.

The survey helped to pinpoint the types of furnaces which were basically inefficient and also to arrive at the causes for inefficiency. It also helped in identifying the types of furnaces most suited to give good thermal performance and the importance of the design of furnace on fuel economy. These findings of the survey were discussed with the industry, and remedial measures, wherever possible, were suggested. Norms were also laid down for oil consumption in furnaces, of various sizes, melting soda-lime glass used for production of containerware, lampware and refills for thermos flasks. The findings of the survey would go a long way in optimizing fuel oil consumption and in rationalizing the distribution of fuel oil in the glass industry.

Fibre Board Packing Cases and Pine Wool from Pine Needles

Huge quantities of pine [*Pinus roxburghii* (*P. longifolia*)] needles, which amount to nearly 2·7 million tonnes per annum, are available from the forests of Jammu & Kashmir and Himachal Pradesh. It is estimated that on an average about a tonne of needles falls down per hectare per year. Presently the needles are not being used for commercial purposes. Even if 5% of the annual fall of pine needles is collected from easily approachable forests, the quantity will amount to 1,35,000 tonnes—75,000 tonnes in J & K and 60,000 tonnes in Himachal Pradesh.

The Regional Research Laboratory, Jammu, has worked out a process for the production from pine needles of fibre boards suitable for making packing boxes. The process consists in giving a softening treatment to the pine needles, followed by defibration. The coarse pulp is converted into a sheet or mat and compressed in a hydraulic press. The yield of the finished product from pine needles varies from 50 to 60% depending on the quality of raw material. The modulus of rupture of the fibre board is 225-280 kg/cm², and its tensile strength varies from 125 to 150 kg/cm². After a water-proofing treatment, the board can [illegible] used for making packing cases for fruit transport. The annual requirement of fruit packing cases in Jammu & Kashmir is about 25 lakh boxes and that of Himachal Pradesh, 86 lakh boxes. The packing box designed by the laboratory can withstand a static load of one tonne when fully packed.

A small-scale unit of 2-tonne per day capacity fibre board plant can produce about 850 packing cases a day. The unit can be set up at sites where the raw material is abundantly available. It will require a total capital of Rs 10 lakh, which will yield a profit of Rs 2·6 lakh. The estimated cost of production of fibre board is about 32 paise per sq ft and that of a packing box of 20 kg capacity is Rs 4·80. Each unit of 2-tonne capacity will require about 960 tonnes of pine needles per year.

The know-how for large-scale processing of pine needles into pine wool has also been developed by the Regional Research Laboratory, Jammu.

Pine wool can be used as a stuffing material in mattresses, cushions, furniture, etc. The wool can also be used for packing crockery, glassware and other fragile articles. There is good scope of its application in rubber foam and as a thermal insulating material.

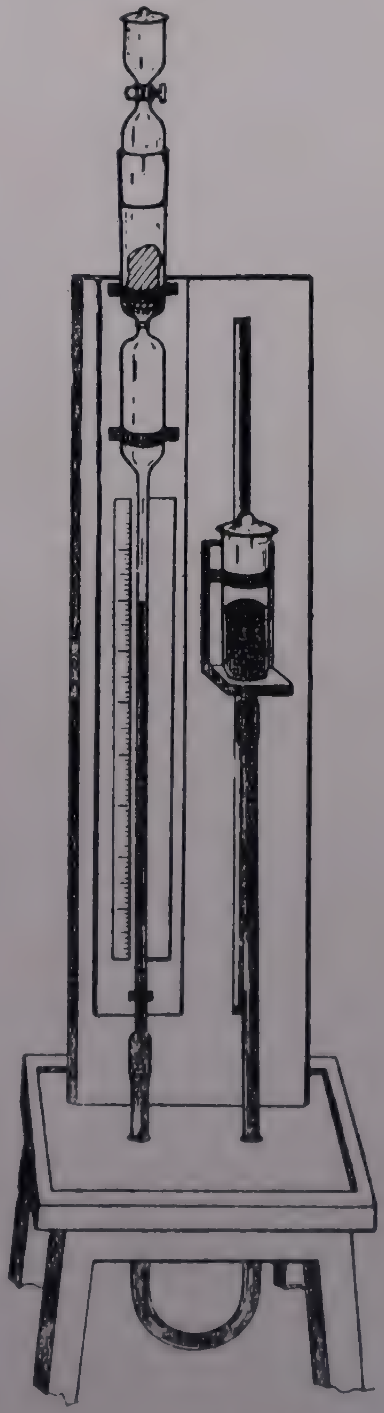
The estimated cost of production of pine wool is about Rs 800 per tonne. A plant of one-tonne per day capacity can be set up at a cost of about Rs 2·80 lakh. The process consists in giving a softening treatment to the pine needles followed by separation of fibres. The plant and machinery are indigenously available. The quality of the fibres can be varied depending upon the service requirement. The know-how is available with the Regional Research Laboratory, Canal Road, Jammu-Tawi, on payment.

NGRI's Porosimeter

A porosimeter for measuring the material porosity of rocks and other porous materials has been developed by Drs Y. V. Ramana and B. Venkatanarayana at the National Geophysical Research Institute (NGRI), Hyderabad. Determination of material porosity is frequently carried out in ceramic and metallurgical industries, and the NGRI's instrument would be handy for the purpose.

The instrument (Indian Pat. 131718), kept in a vertical position by a rigid stand with clamps, helps in estimating grain volume.

The main advantage of the device lies in the simplification of operations, quickness and repeatability. This device has none of the disadvantages of Tickell's instrument, such as contamination of mercury and bubble formation during filling.



Porosimeter developed at NGRI, Hyderabad

The porosimeter (U-shaped) comprises a funnel top, a stopper, a sample chamber and a graduated capillary tube connected in that order from top to bottom, wherein a polythene tube is connected to the graduated capillary tube the other end of which joins the mercury reservoir. The difference in heights of the mercury column in the capillary tube with and without a sample in the sample chamber gives the grain volume and the percentage porosity of the sample.

Irradiation Effects on *Sesamum indicum* and *Martynia diandra* Plants

In recent years, the study of changes induced in plants exposed to ionizing radiations has attracted the attention of researchers. Plant development represents a regular succession of growth and differentiation process, including various correlated phenomena. Exposure of plants to ionizing radiation may upset the balance and induce cytological, morphological and physiological changes in the cell which are usually reflected as morphogenetic abnormalities. The response depends upon the species, its age, physiological conditions, radiosensitivity, dose rate and environmental conditions. Shri Ravindra Nath at the National Botanical Gardens, Lucknow, has studied the effect of gamma irradiation on *Sesamum indicum* D.C. var. N.P.6 and *Martynia diandra* Glox. The study included morphological, anatomical, cytomorphological and other changes brought about by gamma radiation. *Sesamum* is an important oilseed crop of great economic value, and *Martynia* has phylogenetic significance. The study was carried out at the Plant Morphology and Seed Laboratory of NBG under the supervision of Dr R. P. Singh of the laboratory.

Germination studies conducted on *S. indicum* during two consecutive years have revealed that doses lower than 10,000 rad and higher than 20,000 rad have deleterious effects. Germination was stimulated at 10,000 rad and such an anomalous stimulation of germination was perhaps due to the effect of this particular dose on the formation of 'Dormin' or Dormin-like substances. Irrespective of the germination behaviour, the degree of survival of the seedlings was inversely proportional to the dose rate. Gamma radiation had a pronounced inhibitory effect, particularly in doses higher than 5000 rad, on the shoot growth. The percentage of injury or inhibition was directly proportional to the dose rate. The roots appeared to be more radiosensitive than hypocotyl. The fresh weight of the seedlings showed almost a parallel relationship with their height. However, the dry weight of the seedlings decreased significantly at doses higher than 10,000 rad. Expansion of cotyledons in *Sesamum* was significantly inhibited by various doses of gamma rays. In most of the cases in *Sesamum* as well as in *Martynia*, 90-100% of the first nodal leaves exhibited structural abnormalities. Chlorophyll-deficient chimeras were also observed in a few isolated cases, particularly under high doses.

The shoot apices exhibited a marked degree of behavioural and organizational differences under control and treatment. The inner tunica layer appeared to be most sensitive to radiation. In a few isolated cases in *Sesamum*, periclinal divisions were seen in the cells of outer as well as inner tunica layers. Occurrence of more than one nucleus in each cell, vacuolation, disruption and collapse of the cells due to lysis and necrosis was observed in *Sesamum* shoot apices under higher doses. Gamma radiation brought about early maturation and considerable elongation of meristematic cells. Cytohistological zonation was disrupted in the dose range beyond 15,000 rad and 5000 rad in *Sesamum* and *Martynia* respectively.

In certain treated plants of *Sesamum*, anomalous inflorescence-like flowers were developed. However, gamma rays did not change the basic pattern of the vasculature of these flowers. Marked variation occurred in the shape, number of locules, and relative position of anthers in irradiated material. The stamens appeared to be most affected in various ways in the treated material. Polyspory and compound microspore tetrads were common in the treated material. Sterility and occurrence of various types of abnormal pollen grains were due to abnormal behaviour of the tapetal cells and chromosomal aberrations during microsporogenesis. Various doses of gamma rays induced significant changes in the tapetal cells.

Irradiation also induced formation of accessory carpels. Thus, tri- and tetra-carpellary ovaries were quite frequent.

There appeared to be some tendency towards the development of tetrasporic embryo sacs in treated material. Disturbed polarity of the nuclei of the embryo sacs and formation of more than eight or less than eight nuclei in an embryo sac was quite frequent in the irradiated material. Also, in such embryo sacs, the antipodals tended to persist longer.

Endosperm was found to be radioresistant. Even the highest doses of gamma rays did not bring about any significant change in the basic pattern of development and structure. However, it is likely to be susceptible in its very early stages of development. Radiation also did not have any effect on the structure of the seed coat, but it induced pleiocotyly in the embryo.

Some treated *Sesamum* plants produced fruits showing incomplete fusion of the carpels, bearing exposed seeds.

Certain interesting teratological changes were also observed. An abnormal stamen developed on the wall of the ovary in *Sesamum*, bearing ovular primordia. The stamen and the ovules were otherwise normal in structure.

Vascular anatomy of the seedlings revealed that the vasculature of the root-hypocotyl-cotyledons constitute one single unit, separate initially from that of the plumule.

Shri Ravindra Nath* was awarded the Ph.D. degree of the Kanpur University, Kanpur, for his thesis entitled 'Morphological, anatomical, cytomorphological and embryological studies in *Sesamum indicum* D.C. and *Martynia diandra* Glox'.

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*Presently at the Punjab Agricultural University, Ludhiana

CSIR Support To Research

New Schemes

Cytogenetical and Biochemical Prognosis of Myeloproliferative Disorders

In spite of a good deal of work the interpretation of chromosomal abnormalities in myeloproliferative disorders remains controversial. The chromosomal aberrations represent genetic changes causally related to the genesis of the various disorders. Alternatively, chromosomal changes and morphological or phenotypical changes in the nuclear structure may be incidental to the development of disorders. To evaluate these possibilities, it is necessary to study the chromosomal pattern in pre-disease stages and also in the other healthy family members of the diseased cases. It is also necessary to make fluorescent and autoradiographic studies, as these combine the chromosome metabolism and morphology. In order to understand the detailed cell function, such studies must be extended to the biochemical level. It may be possible to obtain considerable information once the automated techniques are fully utilized. The enhanced precision of chromosome measurement may reveal such changes as are not detected by simple inspection.

Cytogenetical studies in leukaemias, lymphomas and other myeloproliferative disorders can be more fruitful if the actual malignant cells are sampled by devising a suitable technique. Cytogenetical studies play an important role in prognosis.

Under a new CSIR scheme granted to him, Prof. G. P. Sharma (principal investigator), Head, Department of Zoology, Panjab University, Chandigarh, with Dr R.C. Sobti (co-investigator), proposes to make cytogenetical and biochemical prognosis of myeloproliferative disorders in human beings.

Haemopoetic (myeloproliferative) disorders can be induced by viruses, chemicals and drugs, but the cytogenetical aspect of prognosis of any disease does not appear to have received much attention. The proposed studies on laboratory mammals and extension to normal human beings are expected to yield significant results.

Chromosome Banding Patterns for Study of Genetic Disorders

The study of human chromosomes and the detection of genetic disorders has become a topic of increasing importance during the past few years. Advances in tissue culture techniques which have markedly reduced the complexity of growing cells, micromethods for biochemical assays and elegant techniques for chromosome analysis from peripheral blood leucocytes and other organs have all contributed to the rapid advances in this field.

Identification of chromosome segments with the aid of these methods has been greatly facilitated, particularly due to the invention of banding pattern techniques. The different banding patterns such as Q banding through UV fluorescence, G banding through different procedures for denaturation techniques, R banding through controlled heating, O banding through salt treatment as well as C banding involving denaturation and reannealing have been useful in locating marker segments in chromosomes. These techniques have opened up the possibility of identifying functionally different chromosome segments, as correlated with the behaviour and metabolism of the organism.

In a new CSIR scheme granted to her, Dr (Mrs) Archana Sharma, Reader in Cytogenetics, Department of Botany, University of Calcutta, Calcutta, proposes to identify the precise chromosome segments which may be involved in the gross abnormalities, using banding techniques. The assesment of the inheritance patterns of different enzymes and proteins in the blood of normal populations in comparison with those carrying congenital metabolic disorders through biochemical methods and simultaneous analysis of chromosomes of afflicted persons may enable the identification of chromosome segments with certain metabolic disorders.

The application of different banding techniques on normal individuals as well as on those suffering from different forms of blood group diseases, growth disorders and other forms of inherited anomalies, frequently encountered in screening hospital population, may enable correlation of one or more of these bands with such disorders.

According to WHO Report (1969) about 1% of all live births have chromosomal anomalies. This estimation has been made by the earlier methods. Banding pattern techniques, developed recently, will enable the detection of smaller chromosomal abnormalities earlier unobserved.

The research plan includes: (i) collection of blood from patients with clinical records, (ii) preparation of leucocyte culture, harvesting and preparation of air-dry spreads through standard methods, (iii) application of different banding and staining techniques, (iv) comparative analysis of G, C, R and O bands of the different individuals, and (v) complete scanning of the variations observed in the population and correlation of the bands with metabolic disorders, wherever possible.

This study is expected to lead to the correlation of the commoner forms of diseases, if of genetic nature, with specific banding patterns on the chromosomes. It will form a diagnostic tool for the assessment of genetic diseases (specially in India where the proportion of genetic disorders has not yet been assessed) both at individual and population levels.

Synthesis and Pharmacological Evaluation of Substituted Quinoxaline Pyrrolidin-2-ones and Substituted Quinoline Pyrrolidin-2-ones

The most serious obstacle to the development of malaria chemotherapy has been the appearance of strains of plasmodia resistant to 4-aminoquinolines; such strains are often cross-resistant to all other synthetic antimalarial drugs. Under a new CSIR research scheme granted to him, Dr P. Parimoo of the Birla Institute of Technology and Science, Pilani, proposes to synthesize the title compounds and their derivatives as potential inhibitors of the biosynthesis and/or function of coenzyme Q_8 (indispensable in the metabolism of plasmodium) at the mitochondrial NADH and succinoxidase system in the plasmodium.

Hitherto, only the Gram-positive bacteria could be controlled with confidence. There has been always a problem of superinfections with Gram-negative bacteria and smaller viruses. No effective agent is available for many strains of infectious bacteria such as pseudomonas, protens and aerobacter. Salmonella infections are also imperfectly controlled although as many as 60 antibiotics are now in clinical use. The proposed investigation is an approach to chemotherapy based on the exploitation of the metabolic differences between the parasite and the host, and it is expected that the aforementioned compounds might possess antimalarial, antibacterial and antiviral properties.

Completed Schemes

Pseudopotentials in Metals

Dr S. K. Srivastava, a CSIR research fellow who worked at the Physics Department, Allahabad University, during 1 January 1973 to 31 December 1974, has developed a new pseudopotential spherical function $s_1(x)$ [*Phys. stat. sol.*, **64** (1974), 679] which behaves like other well-known spherical functions such as spherical Bassel function $j_l(x)$, spherical Neumann function $n_l(x)$, and spherical Nankel function $h_l(x)$. A few recurrence relations of the new spherical function have also been investigated. The spherical function $s_l(x)$ has been applied in the description of electron-ion interaction and the effective density of electrons. The theory presents a few one-parameter models of the author [*Phys. stat. sol.*, **61** (1974), 731]. The effective density, ρ (q), of certain metals is in agreement with the values obtained from the atomic orbitals method. A non-parametric model pseudopotential has also been propounded by the research fellow [*Phys. stat. sol.*, **66** (1974), 93]; this is more applicable than the models of Ziman and Gerstenkorn.

The above new models have been incorporated in the coherent study of various metallic properties like electronic, transport, magnetic, atomic and electron-phonon interaction of a number of metals from valency $Z=1$ to $Z=6$. Very satisfactory results were obtained. In some cases, results were better than those obtained by Ashcraft's model. The theory has been extended to the metallic alloys also. The electrical resistivity and thermoelectric power of certain monovalent binary alloys and mercury alloys were determined and the results were encouraging.

Bulletin of Indian Raw Materials and their Utilization

This new quarterly bulletin, started by the Publications & Information Directorate, New Delhi, in October 1974 has evoked considerable interest among a variety of users—research workers, industrial entrepreneurs, and others. In response to suggestions received from users, it has been decided to include indicative abstracts under each entry, effective from July 1975 issue. Statistical data will also be indicated, whenever available.

Xerox copies of full papers referred to in the bulletin will be supplied at Rs 2 per page. Requests for copies of original material may be addressed to the Scientist-in-charge, Library & Reference Section, Publications & Information Directorate (CSIR), Hillside Road, New Delhi 110012.

PATENTS FILED

67/Cal/75: Improvements in or relating to sintered porous metal hydrogen electrodes used in low-temperature hydrogen-oxygen fuel cell, V.K. Venkatesan, H.V.K. Udupa, R. Pattabiraman, T.R. Jayaraman & C.P. Janaki Amma Indira—CECRI, Karaikudi.

70/Cal/75: Improvements in or relating to zinc-lead dioxide batteries, P.B. Mathur, P.N. Namboodiri & R. Balasubramanian—CECRI, Karaikudi.

72/Cal/75: Improvements in or relating to a process for production of decolorizing type active carbon from softwood saw dust or the like, S. Banerjee, S. Mazumdar, D.K. Banerjee, A.C. Dutta & A.K. Roy—CFRI, Dhanbad.

73/Cal/75: Improvements in or relating to a process for production of gas or vapour adsorption type active carbon pellets and/or catalyst support from saw dust, coconut shell dust or the like, S. Banerjee, S. Mazumdar, A.K. Roy, A.C. Dutta & D.K. Banerjee—CFRI, Dhanbad.

113/Cal/75: Extraction of nickel and cobalt values from lateritic and limonitic nickeliferous ores by coal reduction and ammoniacal leaching in the presence of a catalyst, B.N. Singh, M. Mahanty, D.D. Akerkar & V.A. Altekar—NML, Jamshedpur.

116/Cal/75: Improvements in or relating to preparation of pigment-grade calcium chromate, S. Guruviah, M. Sundaram, V. Chandrasekharan & K.S. Rajagopalan—CECRI, Karaikudi.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 7/75

The Regional Research Laboratory, Jorhat, has been established with the objective of helping in the development of north-east India which includes Assam, Nagaland, Meghalaya and other states. The region is rich in natural resources of plant origin and affords great scope for economic and industrial development based on plants and plant products. It is, therefore, proposed to make the appointment of a senior scientist in the grade of Rs 2000-2500 who will provide leadership in the area of applied and economic botany. As a senior research management person, he will be expected to formulate research programmes and their implementation, manage, coordinate and evaluate the research programmes and related development and pilot projects. He should also help in the transfer of research results from the laboratory to industry and the field.

Qualifications : High academic qualifications in a botanical subject and considerable research experience in the field of applied botany or allied areas; proven research experience and management abilities related to the job requirements mentioned above; knowledge and experience of various aspects of introduction and cultivation of economic plants such as essential oil and medicinal plants. Those who have handled large projects and process design will be given preference.

Salary/Conditions of Service : The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merits. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and latest annual report of the laboratory. Completed *curriculum vitae* proforma must be received in this office on or before 11 September 1975.

Convassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

* Interim enquiries will not be attended to *

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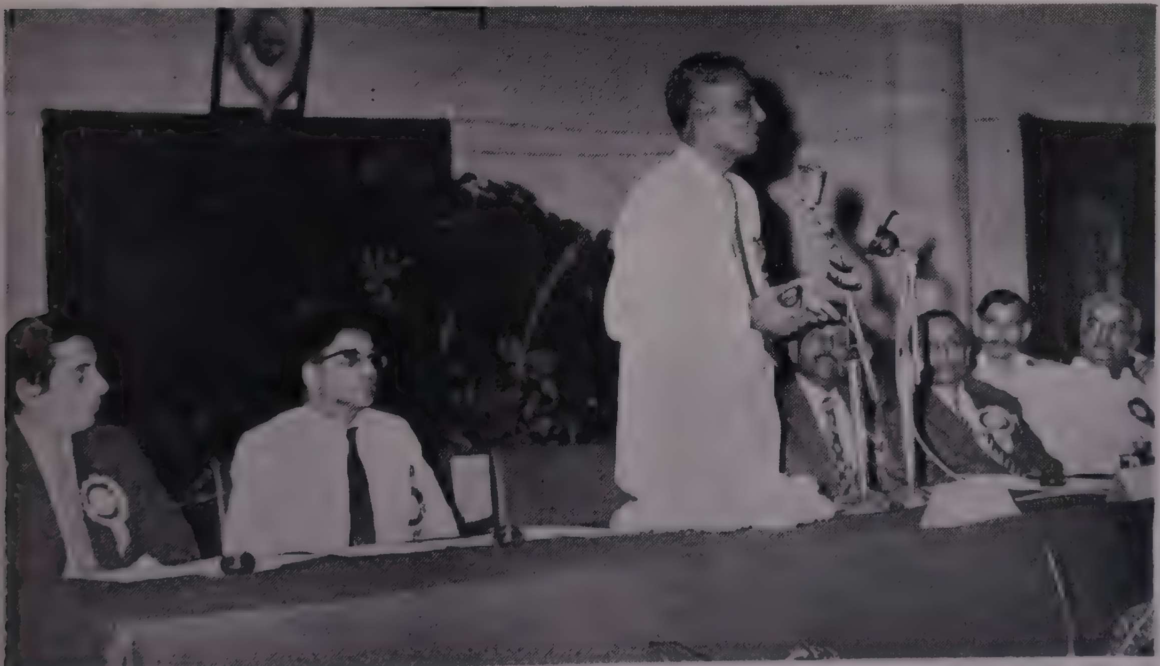
Government-CSIR-Industry Meet at Bangalore

Coinciding with the 26th Conference of Directors of CSIR Laboratories and Cooperative Industrial Research Associations held at the National Aeronautical Laboratory (NAL), Bangalore, a Government-CSIR-Industry Meet was organized for the first time in the State of Karnataka. Sponsored by the Karnataka State Board of the All India Manufacturers' Association, Federation of Karnataka Chamber of Commerce and Industry, Karnataka Small Scale Industries Association, the Government of Karnataka and CSIR, the two-day meet was inaugurated on 7 June 1975 at Vidhana Soudha by Shri Mohanlal Sukhadia, Governor of Karnataka. The key-note address was delivered by Shri P. N. Haksar, Deputy Chairman, Planning Commission and Vice President, CSIR. Shri M. Y. Ghorpade, Finance Minister, Government of Karnataka, presided.

In his address, Shri Haksar said that the country needed today a mixed technology covering the entire gamut of socio-economic needs such as food, education and industry and the time had come for the country to have a clear perception of what kind of technology it needed and in which areas. When the country needed a whole range of technological know-how, it was futile to depend merely on capital-oriented imported technology. Commenting on the Indian industry's excessive dependence on borrowed technology, he expressed the view that indigenous scientific and technological know-how should be put to test to get the desired results.

The Vice President of CSIR also expressed the hope that the scientists should explore how best indigenous know-how could be put to use in industry. He reminded the industrialists that what the country needed today was their commitment and dedication to usher in an industrial revolution missed by the country for a century. This, he said, could not be done merely by depending on borrowed technology which often became obsolete.


Prof. Y. Nayudamma, Director General, CSIR, addressing the participants of the Government-CSIR-Industry Meet

The business session was held on 8 July in the Vidhana Soudha Conference Hall where the Directors of the laboratories, representatives of the State Government and the organizers, besides the entrepreneurs, participated. The Survey Report on the Development Programmes of Karnataka State prepared jointly by the National Aeronautical Laboratory, the Central Food Technological Research Institute and the Indian Plywood Industries Research Institute formed the basis for discussion at the session.

One of the important recommendations of the meet was that CSIR should establish a Polytechnology Clinic in Karnataka with financial participation to the extent of 50% by industry. The objective of the proposed clinic would be to bridge the communication gap between the technologists and the user of technology by establishing an intimate two-way rapport with the user industry and government agencies on the one hand and with the network of CSIR and other R & D agencies on the other, and assist in the solution of problems including those of analysis and testing by directing the user to the appropriate agency. It will be an useful link with the Director of Industries, small and medium scale industries, Small Industries Service Institute, universities, etc. on the one hand and CSIR laboratories on the other.

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Annual Technical Convention of Indian Institute of Mineral Engineers at NML

As part of its silver jubilee year celebrations the National Metallurgical Laboratory (NML), Jamshedpur, organized in association with the Indian Institute of Mineral Engineers the seventh Annual Technical Convention on 11-12 July 1975. Shri A. N. Banerjee, Chairman and Managing Director, Hindustan Zinc Ltd, presided over and inaugurated the convention.

In his presidential address, Prof. V. A. Altekar, President, Indian Institute of Mineral Engineers and Director, NML, said that this year's convention had a special significance to NML as it formed part of the laboratory's silver jubilee year celebrations. Prof. Altekar said that the mineral resources were depleting assets and had to be properly utilized and conserved. Proper utilization of mineral deposits calls for overall and maximum recovery of the valuable constituents at minimum cost and for higher gain by adopting appropriate technologies. Such steps would extend the effective life and yield of deposits. As a leading exporter of minerals and ores, India had to pay special attention to research and development work on the beneficiation and agglomeration of the country's important raw materials, such as iron ores, manganese ores, and ilmenite. This would enable the exploitation of ore reserves economically and the country would thereby earn foreign exchange. He made a mention of the change in the export trend—export of ferro-manganese instead of manganese ore—in India during 1950s, which made it possible to earn a higher quantum of foreign exchange for processed goods.

Speaking about India's limited reserves of chromite ores, Prof. Altekar said that it was often debated whether we should export chromites, which are hardly sufficient to meet the internal demands. The Orissa ores are internally used for metallurgical purposes. However, a considerable portion is obtained as chrome fines which constitute more than half of the reserves. Recently, these chrome fines had been exported as they were considered unusable in country. Prof. Altekar said that NML had developed a process for upgrading and refining low-grade chromite fines. The experiments had been conducted on a pilot plant scale and it was possible to make use of these chromite fines by upgrading them using the NML process. Hence these chromite ore fines need not be exported.

India has been exporting large quantities of iron ores at a considerable loss of foreign exchange. Prof. Altekar said that NML scientists had developed a process for the production of sponge iron. The commercial plant of Andhra Cement Co. Ltd at Vijayawada was inaugurated on 2 June 1975. By exporting iron ore it was possible to earn only $ 10-12 per tonne, but if the same ore was turned into sponge iron and exported it was possible to earn anywhere from $ 100 to 120 per tonne. He appealed to the Government that schemes for putting up more sponge iron plants in the country should be taken up and that a liberalized licensing policy to allow entrepreneurs to set up sponge iron plants should be encouraged.

The National Metallurgical Laboratory had carried out significant research and development work on upgrading and beneficiation of low-grade minerals such as iron ores, ilmenite, chromite, magnesite, kyanite, sillimanite, graphite, and phosphate rock. Pilot plant trials for upgrading these raw materials had been conducted at NML. It is in the interest of the country that a sufficient number of plants are set up for the beneficiation of each of the raw materials both for use in the country and for export purposes, the Director said.

Prof. Altekar added that some of the scientists from NML were working at the Mysore Iron & Steel Ltd, Bhadravati, to evolve and implement technology for extraction of vanadium from low-grade vanadiferous iron ores. These in-plant trials were based on the experience of scientists at NML over the years.

Prof. Altekar also underlined the need to have a full-fledged Central Mineral Beneficiation Institute and an Iron Ore Institute in the country, as the present facilities available for beneficiation of different raw materials are insufficient to meet the demand.

Shri A. N. Banerjee, delivering the key-note address, reiterated the view that India could earn greater amounts of foreign exchange by exporting beneficiated raw materials. Minerals engineers had to play an important role in this direction. We must put into practice the new technologies to make better utilization of the existing raw materials in the country. Reserves of each and every raw material available in the country must be exploited to meet the increasing demands for basic metals, Shri Banerjee added.

Instrumentation for Measurement and Control of Fibre Length : Seminar

A seminar on 'Recent progress in instrumentation for the measurement and control of fibre length' was held on 29 April 1975 at Century Bhavan, Bombay, under the joint auspices of the Bombay Textile Research Association (BTRA), Bombay, the Trade Commission for the Hungarian People's Republic, Metrimpex, Budapest and the World Traders & Co., Bombay.

Dr J. Markus, Hungarian Trade Commercial Counsellor, while speaking at the seminar, traced the progress made by Hungary in the field of instrumentation. Referring to the cooperation that existed between the Indian and Hungarian Governments, he praised the important role played by BTRA, the Textile Research Institute, Budapest, and Metrimpex.

Three papers were presented at the technical session. The paper on 'Fibre control programme', presented by Eric Schwarz (Metrimpex-Metefem), described a scheme for control of fibre length in day-to-day processing from raw cotton to finisher head sliver and brought to light the advantages accruing from length studies by way of uniformity of mixings, optimum utilization, lower end-breakages and improved production. M. Radhakrishnan and A. V. Ravindranathan (BTRA) reviewed the techniques of fibre length estimation and presented useful correlations to enable the spinner to interpret data obtained on various instruments. J. K. Shah of Arvind Mills, Ahmedabad, presented a paper entitled 'A spinner's evaluation of some testing instruments'. The practical utility of new instruments like the digital fibrograph and YET evenness tester for quality control in spinning was discussed in his paper.

The Metrimpex autosampler digital fibrograph (FM-22) was demonstrated at the seminar. This instrument, having third-generation electronic circuitry, could automatically sample out and display the fibre length parameters in a very short time (40-45 sec). The results are automatically printed out.

As many as 150 persons from industry and research institutions attended the seminar.

SYNTHESES OF STEROIDS AND ALKALOIDS OF PHARMACOLOGICAL IMPORTANCE

Bhatnagar Prize-winner Prof. Kessar's Work

The work of Prof. Kessar has been primarily concerned with the development of new methods of organic synthesis and their application to the preparation of naturally occurring compounds of pharmacological interest. Some mechanistic studies connected with the synthetic work have also been carried out.

Steroidal sapogenins and solanum alkaloids

Steroidal sapogenins and solanum alkaloids constitute two important groups of complex compounds which had defied synthesis for a long time. A common route to these has been elaborated by making use of a C-22 nitro group as a versatile masked precursor. The key step in the sequence is a Michael addition of a functionalized nitroalkane to a $\Delta^{17,20}$-16-carbonyl compound. Conditions conducive to steric control at each of the five new asymmetric centres were worked out by a detailed stereochemical analysis and some model experiments. The route is flexible and admits approach to even atypical members of the series. Through this route, syntheses of the compounds, solanidine, demissidine, tomatidine, solasodine, diosgenin, yamogenin, cholesterol, isonarthogenin, septrumgenin and verazine have been accomplished.

Azasteroids

Another area of Prof. Kessar's interest is heterosteroids, in which a carbon atom of the steroidal nucleus can be replaced by a nitrogen or sulphur atom resulting in the enhancement or alteration of activity of the parent compound. With this in view, total syntheses of 13-azaequilenin, 13-aza-15-thiaequilenin and 13-aza-15-oxoequilenin were carried out. Some compounds of the 11-aza series were also prepared and found to exhibit interesting physiological properties.

Benzyne cyclization reaction

Prof. Kessar's researches for finding an effective procedure for intramolecular linking of aromatic rings have led to a new synthetic procedure of wide utility in heterocyclic chemistry. It has been shown that the Schiff bases from halogenated aldehydes and aromatic amines furnish, on exposure to amide ions, phenanthridines in excellent yields. A detailed mechanistic investigation revealed that the reaction follows a course in accordance with the rationale of its development, i.e. addition of amide ions across the carbon-nitrogen double bond, generation of benzyne cyclization and expulsion of the addendum. A large variety of polynuclear heterocycles has been obtained by this procedure which has been named as 'Kessar benzyne cyclization'.

Currently, Prof. Kessar is carrying out research in synthetic photochemistry.

HAPLOIDS : A NEW DIMENSION IN BOTANICAL RESEARCH

Bhatnagar Prize-winner
Prof. Maheshwari's Work

Prof. Maheshwari and coworkers have done pioneering work on the development of the technique for growing haploids from anthers and the technique is regarded as a major breakthrough in biological field. The work was started by Prof. Maheshwari's student (Dr Sipra Mukherjee), who for the first time cultured anthers of a higher plant successfully in a test-tube showing thereby their manipulation to form embryoids from the pollen grains. Haploids provide a short-cut to the production of pure lines which in normal course takes several years of painstaking work. Haploid embryos, on the other hand, can be produced in large numbers in a few weeks' time.

Prof. Maheswari

To be of use in agriculture it is imperative to maximize production of pollen embryoids in cultured anthers. Towards this end Maheshwari and coworkers studied simple parameters like the critical stage of anther development, effect of physical factors like light, temperature, pH and the most effective mode of implantation of the anther in the culture medium. Anthers containing uninucleate pollen have been found to be most suitable for initiation of embryogenesis. The percentage of anthers producing pollen embr-

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Prof. S. V. Kessar has been selected for the Shanti Swarup Bhatnagar Prize in Chemical Sciences for the year 1972 (jointly with Dr A. P. B. Sinha of NCL, Poona) [*CSIR News*, **25** (1975), 72]. Presently, he is Professor of Organic Chemistry at the Panjab University, Chandigarh.

Prof. S. C. Maheshwari has been selected for the Shanti Swarup Bhatnagar Prize in Biological Sciences for the year 1972 (jointly with Prof. B. B. Biswas of Bose Institute) [*CSIR News*, **25** (1975), 72]. Presently, he is Professor of Botany at the Delhi University, Delhi.

yoids was found to increase linearly between 22° and 30°C; no embryoids were produced at lower temperatures (15°-20°C). Darkness stimulated embryoid formation; exposure to light decreased its percentage considerably. If cultures were maintained under continuous red illumination, no embryoids were formed. The inhibitory effect of red light could not be reversed by white light. Recent work has indicated that ordinary white light and a normal light-dark alternating treatment are superior to monochromatic red light or continuous light.

Iron has been found to be very essential for the induction of haploid embryos. In its absence or when it is present in concentrations $\leq 10^{-6}$ *M* (iron supplied as $FeSO_4$) few embryoids are produced. The maximal response is at 10^{-5} *M* of iron. A chelating agent, EDDHA, markedly enhances the capacity of anthers to form embryoids. Indeed, it is being routinely used with an appropriate concentration of $FeSO_4$. Among a large number of hormones tried, cytokinin was found to be the most effective. The bulk of the work on haploids relates to a common weed of wastelands, *Datura innoxia*. However, a plant of horticultural importance, *Petunia hybrida* can also be made to produce haploid plants. This is of interest because, out of hundreds of plants tried all over the world very few have been successfully manipulated to produce haploid plants. Another major line of investigation being studied concerns the production of mutants in haploid lines.

The work of Maheshwari and coworkers on haploids has been regarded so important that many laboratories have shifted their attention towards haploids research. Two international conferences have also been held and there is a proposal to set up an international institute for research on haploids.

At the California Institute of Technology, Maheshwari and Robert S. Bandurski worked on the isolation of the enzyme RNA polymerase from tobacco. Recognizing the potentiality of *in vitro* approach in relation to intracellular locale of viral synthesis and its mechanism, they studied nucleic acid synthesis in homogenates of normal and TMV-infected tobacco leaf tissue at different periods after inoculation. A method was developed for separating nuclei from chloroplasts. Later, the incorporation of ^{3}H-cytidine and ^{14}C-labelled adenosine triphosphate into RNA was measured in crude homogenate, nuclei and chloroplasts. Only nuclei were used for further experiments as their activity was highest among the fractions tested. It was found that the incorporation was dependent on the presence of all the four ribonucleoside triphosphates (ATP, GTP, CTP and UTP) and the system was generally similar to that reported for animal and plant systems. However, no significant differences between the rates of nucleic acid synthesis of normal and infected tissues were noted.

Maheshwari and his associates have done extensive work on flowering in duckweeds, a group of aquatic plants—the world's smallest flowering plants—which can be grown in test-tubes under controlled laboratory conditions. They found that (i) without iron, flowering does not take place; and (ii) with appropriate photoperiods the level of a hormone, cytokinin, goes up in the plant. These findings led to the development of methods of isolating cytokinins from watermelon and pumpkin; a probable new cytokinin was also isolated.

CROSSED-FIELD DEVICES

Bhatnagar Prize-winner Dr Wadhwa's Work

Crossed-field devices are well suited for various defence and civilian applications because of the advantages such as high efficiency, high output power capability, and phase linearity. However, large noise and instability associated with these devices are the drawbacks coming in their extensive use. Dr Wadhwa started his work relating to noise reduction and stability of these devices in early 60's while carrying out research at the Michigan University (USA) under a project supported by the United States Defence Agency. Since then he has been working on these devices. His studies in this direction have opened completely new vistas for the increased use of these devices.

Dr Wadhwa

Dr Wadhwa has made theoretical and experimental analyses to find out the origin of noise and instability. Various other problems such as inherent gain in the gun region and disturbances due to various interfering modes were also analyzed. Based upon various considerations, a new design of the tube was achieved. This included a gun specially designed for low noise, laminar beam flow and a slight tilt in the cathode in order to result in a uniform electron beam in the interaction region. The delay line was suitably designed so as not to have any interfering mode within the bandwidth of the device. Attenuators were used to attenuate the undesirable modes if they got excited. Matched load conditions were adjusted at the output terminals. A noise transducer after the gun exit was also specially designed and placed for energy exchange between velocity fluctuations noise and current fluctuations noise to result in low-noise device. This device after necessary processing and ageing resulted in a 3·5 dB noise figure whereas the noise figure stipulated by a contract from US Navy was 10 dB. This noise reduction in a crossed-field device was considered a major breakthrough as it opened up a completely new line of thinking that the crossed-field devices need not be inherently noisy. This work further led to various investigations regarding the origin of instability, and

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Dr R. P. Wadhwa has been selected for the Shanti Swarup Bhatnagar Prize in Engineering Sciences for the year 1972 (jointly with Prof. G. Swarup of TIFR, Bombay) [*CSIR News*, **25** (1975), 72]. Dr Wadhwa is Deputy General Manager of the Bharat Electronics Ltd, Bangalore.

several improvements since then have been made.

Based upon the work of Dr Wadhwa, a systematic design criterion has been made for designing crossed-field devices including carcinotron which would result in low noise, high stability and high-efficiency operation. Several other studies have been made to further reduce the overall noise in these devices. For example, by suitably tilting the cathode in the gun region and incorporating suitable additional magnetic fields near the cathode, it was possible to reduce the noise.

Theoretical and experimental studies made by Dr Wadhwa have led to the increased dynamic range of the electron gun. This enables the gun to be used under varying currents and without any deterioration in noise and stability characteristics.

Dr Sharma (PID) Wins J. C. Ghosh Prize

Dr B. C. Sharma of the Publications & Information Directorate, New Delhi, has been awarded Dr J. C. Ghosh prize by the Indian Institute of Science (IISc), Bangalore, for his thesis entitled "Studies on Schiff base complexes of manganese(III) and palladium(II)". This is an annual prize awarded by IISc for the best research work in chemistry carried out at the Department of Inorganic & Physical Chemistry. Dr Sharma's prize is for the year 1973-74 awarded in 1975. Dr Sharma is on the editorial staff of Indian Journal of Chemistry.

Dr Sharma's prize-winning work relates to the stabilization of otherwise unstable manganese(III) state using the synthetic flexibility and chelating nature of Schiff base ligand systems. He has prepared some novel palladium(II) complexes of β-ketoimine type of Schiff bases in which two molecules of an organic chelating ligand show ambidentate coordination in the same complex molecule. Amine-exchange reactions have been carried out successfully for the first time on β-ketoimine type of complexes. These biochemically important reactions have been studied with respect to the effect of various factors like concentration of the attacking amine and basicities and steric nature of the incoming and outgoing amines.

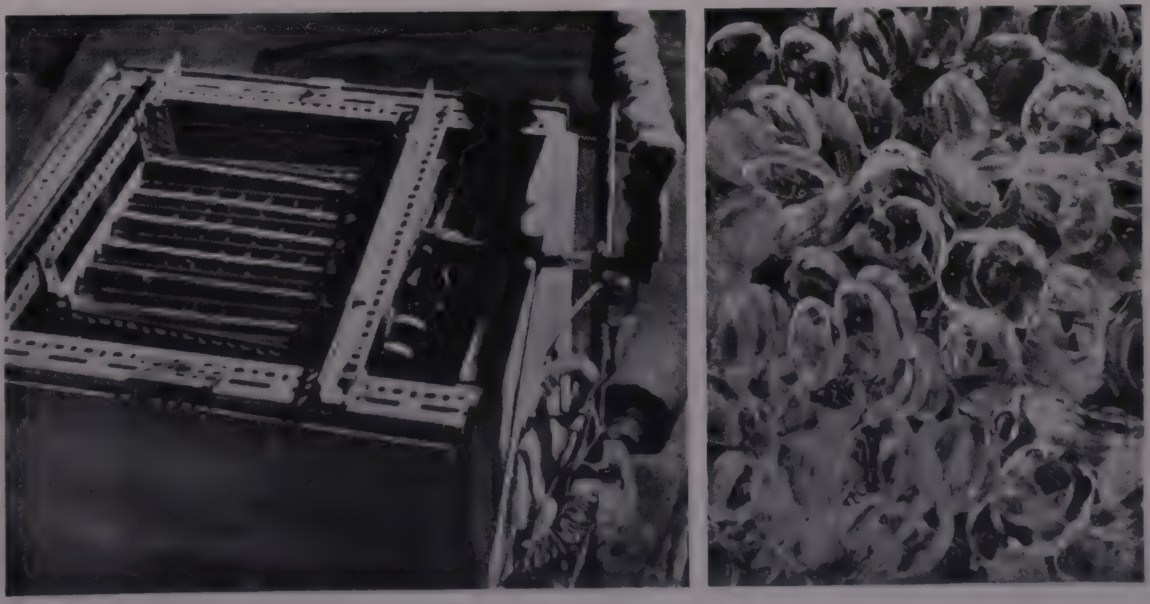
Thermo-emf Current Converter

The Central Scientific Instruments Organisation, Chandigarh, has fabricated a thermo-emf current converter which would find extensive applications in process control industries. It converts different thermocouple emf's into proportional output current for telemetering. The standard output current may be transmitted to a variety of presentation elements or to coupling, regulating and control equipment. Interchangeable plug-in unit can be selected from a wide variety of standard thermocouples and for different temperature ranges for input mode selection. If the thermocouple breaks or becomes disconnected, a drive is provided which causes the output to rise to a maximum or fall to a minimum, as required, to give safe plant operation. Integrated circuitry and industrial-grade components give a high degree of accuracy and dependability over a wide range of environmental conditions. Temperature compensation for the range −10° to +55°C is also provided. The instrument has the following specifications :

Range of thermo-emf	: 0-3 mV
Source resistance	: 0-500 ohms
Output	: 4-20 mA dc
Input impedance	: 500 kohms or more
Output resistance	: 400 kohms
Load resistance	: 0-2 kohms
Accuracy	: ± 1%
Power supply	: 220 V, 50 c/s
Power consumption	: 12W
Dimensions	: 12·5×12·5×25 cm
Weight	: 2·5 kg

CMERI Develops Tip Ice Maker

An automatic direct-freezing type ice-making machine, which produces crystal-clear hemispherical ice tips at a moderate cost, has been developed by the Central Mechanical Engineering Research Institute (CMERI), Durgapur. The machine is compact in size and requires only 220-V 15-amp electric power and proper water supply connection for its functioning. The design enables production of ice in about one hour from the starting of the ice maker; subsequent batches of ice can be produced in 20-26 min. Depending upon the quantity of in-storage, the machine starts and stops automatically as and when required.



Tip ice maker and the tip ice produced by it : CMERI, Durgapur

The ice maker is self-contained and completely indigenous, and requires less initial investment than the other conventional units. The size of tips can be varied as desired, and the ice is hygienic for human consumption. Their special shape and ready-to-use size make the ice tips highly suitable for use in hotels, restaurants, laboratories, etc.

The present prototype of the ice maker is expected to produce about 2 kg of ice in an hour. The estimated cost of the machine is about Rs 9600. Electricity consumption is approximately one unit per hour and the production cost of ice comes to about 24 paise per kg vs 37 paise for the conventional block ice.

Cottage-scale Production of Fish Meal

Bhubaneswar Laboratory's Process

Fish meal finds use in the manufacture of a variety of animal feeds. It is usually produced from 'C' class marine fish and fishery wastes. A major portion of the fish meal is produced in the country by a crude method which results in inferior-quality product. The process and equipment developed by the Regional Research Laboratory, Bhubaneswar, for the production of fish meal is well suited for adoption on a cottage scale, especially at the coastal areas. The process consists in cutting the fish to smaller pieces, cooking the chopped fish to soften the flesh and release the oil, pressing the cooked fish to expel the liquid, drying the pressed cake, grinding the cake to the desired size, and packing in insect-proof gunny bags. This method does not require electric power or steam. The fish meal thus obtained meets the specifications of a good-quality fish meal.

Cottonseed Chemistry and Technology

The Publications & Information Directorate, New Delhi, has brought out a monograph on 'Cottonseed Chemistry and Technology in its Setting in India'. Compiled by (late) Dr K. S. Murti and Dr K. T. Achaya, the monograph provides an exhaustive treatment of the nature and utilization of cottonseed and its derived products in fourteen chapters : Cottonseed industry in retrospect; Trends in production and consumption of cotton and cottonseed; Composition and characteristics of cottonseed; Gossypol; Biological processes and storage of cottonseed; Standards for cottonseed and its products; Pretreatment of cottonseed; Recovery of oil from cottonseed; Processing of cottonseed oil; Hydrogenation; Deodorization of cottonseed oil; Cottonseed oil; Cottonseed cake, meal and flour; and Linters and hulls. While certain chapters are concerned with the cottonseed in Indian setting, treatment of chemical and technological subjects draws upon world information in the field. The monograph also contains comprehensive author and subject indexes.

The publication (demy 4to, 348 pages) is priced Rs 77 per copy, and is available from: Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012.

Progress Reports

NEERI Annual Report : 1974

The annual report of the National Environmental Engineering Research Institute [formerly Central Public Health Engineering Research Institute (CPHERI)], Nagpur, for 1974, published recently, shows that 170 projects, including 30 sponsored projects, were investigated during the year by the institute and its eight zonal laboratories in the following areas : Air pollution and industrial hygiene; Engineering; Epidemiology; Industrial wastes; Instrumentation; Life sciences; Rural sanitation; Sewage; Solid wastes; and Water. Work on 50 projects was completed. A new division of Life Sciences covering bacteriology, virology and biology was created.

As a WHO regional reference centre on air pollution control, the institute continued to collect and transmit data on air quality.

Assessment of ambient air quality was continued as part of the national network for air sampling set up by the institute. The cities under observation during the year were Bombay, Calcutta, Delhi, Kanpur and Nagpur. The following parameters were determined : (i) gaseous pollutants—SO_2, NO_x, H_2S—and oxidants; (ii) suspended particulates; (iii) sulphation rates; and (iv) dust fall.

Work on the characterization and treatability of various industrial waste waters was completed and flow-sheets were evolved for their treatment. Industries covered are (i) J. K. Paper Mills, Rayagada, (ii) olefin plant of Indian Petrochemicals Corporation Ltd, Baroda, and (iii) Ballarpur Paper and Strawboard Mills Ltd.

In the field of instrumentation, the following air pollution monitoring equipment were fabricated and were under trial : (i) direction-activated air sampler, (ii) motor-aspirated radiation shielded thermistor probes, (iii) temperature and humidity index meter, and (iv) motor speed and temperature controlling with silicon controlled rectifier.

An indigenous medium for enumeration of coliforms by M. F. technique has been developed. A suitable composition for enumeration of fecal streptococci is being worked out and attempts are being made to prepare these media in dehydrated powder form.

In the Karimnagar district development programme the institute made considerable progress. The work completed during the year included : (i) construction of 42 units of rural latrines for the Harijan colony; (ii) design of 12 rural water supply schemes; and (iii) waste disposal facility for the Fertilizer Corporation of India Ltd at Karimnagar.

Extension work to popularize the institute's low-cost sanitarywares in rural areas was being carried out in collaboration with the Zilla Parishad, Nagpur.

At the request of the Bangalore City Corporation, feasibility of mechanical composting of city refuse along with sewage sludge from the treatment plant at Bangalore was studied and a detailed report giving the location of the plant was submitted.

A new technique, known as Nalgonda process, has been developed for the removal of fluorides from water. The operations involved are simple and the cost of defluoridation is so low as to permit its adoption by individual families.

Two methods have been standardized for the preparation of secondary cellulose acetate. The properties of the acetate compare well with those of the imported counterpart. Trials on a 2500 litres per day capacity plant are in progress.

Chlorine ampoules of various capacities were developed and the know-how was referred to CSIR for commercial exploitation. Know-how on indigenous production of membrane filter was passed on to three entrepreneurs for commercial exploitation.

Consultancy services were rendered to about 40 organizations. Some of the important consultancy projects relate to : effluent channel for disposal of wastes from industries in and around Baroda; waste treatment plant for Hindustan Organic Chemicals Ltd, Rasayani; gaseous emission inventory of industries in Thana-Belapur area; baseline studies on water supply of Hooghly estuary; and preventive maintenance of water distribution systems.

CSIR Support To Research

New Schemes

Unsteady Magneto Plasma Dynamic Flow

The unsteady plasma flow in an electric power generator is a complex phenomenon because of the variable properties of the gas. Even the parameters of the external electric circuit affect the unsteady flow structure. Since the fluid flow and currents vary with time isochronism, there is the possibility of the occurrence of superposition and beating of oscillations. When the longitudinal pressure gradient varies harmonically and load contains an inductance, the transient regimes for the generator become very complicated. Experimentally it has been observed that the pressure gradient varies significantly with the induction of magnetic field, particularly near the ends of the electrodes.

Even for the usual case of unsteady M.H.D. flow with constant properties, an exact solution is possible only for a very special case of unit magnetic Prandtl number or for some other assumption like negligibly small induced magnetic field.

In a new CSIR research scheme granted to him, Dr M. L. Mittal of the Department of Mathematics, Indian Institute of Technology, Bombay, proposes to analyze the unsteady flow phenomenon, taking into account Hall current and ion-slip current under the influence of a pressure gradient that pulsates relative to the mean. The transverse as well as longitudinal pressure gradients pulsate with different frequencies and amplitudes.

The instabilities that may occur due to preferential ohmic heating or magneto-acoustic instabilities will be investigated. The effect of external electric circuit on the flow phenomenon is another important aspect for investigation.

OTF Measurement and Instrumentation

The optical transfer function (OTF) is now accepted as a more satisfactory objective parameter for specifying the performance quality of an optical system since it has various advantages over the resolving power which has been used as the sole criterion for a long time. Under a new CSIR scheme sanctioned jointly to them, Prof. M. De (principal investigator) and Dr A. K. Ghosh and Dr A. Basuray (co-investigators), Department of Applied Physics, Calcutta University, Calcutta, propose to study the meaningful specification of OTF of a lens or any image-forming system including image receivers such as photographic emulsion, human eye or other photoelectronic devices. The scheme also aims at developing three types of instruments for the measurement of OTF based on three different methods, viz. scanning, autocorrelation and cross-correlation. The instrument based on scanning would be provided with an optoelectronic Fourier analyzer. The second one, based on autocorrelation, would be essentially a shearing interferometer, and the third would depend essentially on the production of a random noise chart based on a novel principle. The project is expected to help in setting up a centre for standard testing of lenses and other imaging systems.

Inhibition of Corrosion of Metals by Electrocapillary Action of Organic Inhibitors

In electrocapillary phenomenon, competitive adsorption is of importance from the point of view of corrosion inhibition. A correlative scale of potentials based on the concept of potential of zero charge of a metal may, therefore, lead to the prediction of the potential range at which the different types of inhibitors should be preferentially adsorbed from the corroding solutions, thus showing a possibility of using the electrocapillary data for the study of the action of inhibitors.

Under a new CSIR research scheme granted to Dr S. N. Banerjee (principal investigator) of the Department of Chemistry, Regional Engineering College, Durgapur, a systematic study will be made of a wide range of organic inhibitors, having one or more 'anchoring' groups containing N, O and S atoms, in acid corrosion of mild steel and of some metals of engineering importance. Besides, attempts will be made to determine inhibition efficiencies of anions of various acids and their synergistic effects with organic inhibitors.

These studies are expected to give information on metal-inhibitor interaction with specific reference to the structure-inhibition, charge-inhibition, adsorption-inhibition, solubility-inhibition and complexation-inhibition relationships. Besides, the study is also expected to throw light on the inhibition efficiencies of a series of organic inhibitors on metallic corrosion in acid solutions.

Chemical Investigation of a Theoretical Model for Pesticidal Pollution and Complexation of Pesticides with Compounds of Biological Interest

Any pesticide residue which accumulates in soil will contribute to the general contamination of the environment. Progressive accumulation of pesticides in agricultural soils could reach some threshold level at which plant uptake might be significant. It is possible that in the future, estimates of expected contribution to environmental contamination will be required before large-scale use of new pesticides is permitted. Reliable prediction of pesticide accumulation in soil would therefore become necessary. However, unlike some of their inorganic predecessors, organic pesticides are decomposed in the environment by biological and physico-chemical processes which influence the amounts that will be found in the environment. Their mere presence in the environment does not necessarily jeopardize public health. The amounts present, their toxicities, and the rate of detoxification and decomposition must be considered in order to assess their significance in the environment.

In a new CSIR research scheme sanctioned to him, Dr R. Sahai, Department of Chemistry, V. S. S. D. College (Kanpur University), Kanpur, proposes (*i*) to develop a theoretical model for the accumulation of pesticides in soil, which will be discussed from the viewpoint of heterogeneous reaction kinetics with the basic aim to understand the complex nature of soil processes relating to the environmental pollution; and (*ii*) to investigate the mode of action and toxicity mechanism of DDT and related pesticides. Based on their earlier investigations, Sahai and coworkers had presented a theoretical model for the accumulation of pesticides in soil, which is applicable to all kinds of pesticides including those that contain heavy metals (e.g. Hg, Pb, Zn and Cu) and the arsenic pesticides. In the proposed study, the pesticide accumulation will be determined for various pesticides in various soils from the experimental data available. If need be, this model will be modified to discuss the persistence of pesticide in soil after the application of pesticide is discontinued. Furthermore, the use of this model for pesticide accumulation in soil may lead to an understanding of the complex nature of soil processes.

A precise knowledge about the basis of toxicity of pesticides is a prerequisite for estimating the pesticidal pollution. In the second part of the project, attempts will be made to correlate the basis of the toxicity of pesticides, on a molecular level, with charge-transfer complexation mechanism. For this purpose, indole would be chosen as the donor species because of its structural relationship with many physiologically active compounds and DDT and related pesticides as acceptors.

Corrigendum

In the article entitled "Mass transfer with chemical reaction and mass transfer characteristics of fluid-fluid contactors" appearing in *CSIR News*, Vol. 25 (14), p. 100, the clause "where the chemical reaction is accompanied by mass transfer" (para 2, lines 3 to 5) should read as : "where the mass transfer is accompanied by chemical reaction".

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NPL Develops Technique for Taking 3-Dimensional Panoramic X-Ray Radiographs

The stereoscopic (3-D) view of an object is seen by an observer because the left and the right eyes reproduce two independent but slightly different images of the object on the retina. These two independent images are superimposed in the brain, giving the impression of the depth of the object, and as the observer moves his position, he also gets a panoramic view because of parallax. The existing technique of taking 3-dimensional X-ray of an object consists in taking two independent X-rays of the object on two separate films from different angles and then using a stereoscope to get a 3-dimensional view. The limitations of this method are that besides using two X-ray films, a special instrument, such as a stereoscope, is needed to get a 3-dimensional view and further the view is not panoramic, i. e. there is no displacement between the near and far portions of the object as is seen in a real 3-dimensional body when the observer moves his head. Also, sometimes, to get an idea of the depth of a foreign object inside the human body, the radiologists take 2-3 radiographs from different directions and then try to interpret the exact position of the foreign object or of the defect in the organs.

The technique developed at the National Physical Laboratory (NPL), New Delhi, for taking 3-dimensional X-ray radiographs uses a radiographic line grid comprising X-ray opaque and X-ray transparent vertical narrow strips. This radiographic grid is placed between the object and the radiographic film and several strip radiographs of the object are taken on the same film, using conventional X-ray machines and films. The composite radiograph so obtained is placed behind a photographic line grid (replica of radiographic grid) and when viewed with illumination from behind, gives a 3-dimensional panoramic view of the object.

All the techniques of making the radiographic line grids for taking the composite X-ray radiograph and of making the photographic grid for viewing the 3-dimensional X-ray radiograph have been developed at NPL. So far, the radiographic grids usable up to 100 kV X-ray sources have been developed and work on higher kV grids for industrial radiography is in progress.

The main advantages of 3-dimensional X-ray technique developed at NPL are as follows :

(1) On a single film, many X-ray images can be taken, thereby reducing the expenditure on X-ray films.
(2) Conventional X-ray equipment and films are used.
(3) No viewing aid, for example stereoscope, is required.
(4) The method is simple and gives not only a 3-dimensional view of the object but also a full panorama, which is very necessary for the precise location of the depth of an object.

Utilization of Squilla : CFTRI Process

The Central Food Technological Research Institute, Mysore, has developed a process for the production of a highly viscous chitosan (2-amino-2-deoxy-D-glucose) from squilla, a trash fish.

Large quantities of squilla, or *Puchee*, are caught along with prawn catch, its total daily catch along the Mangalore coast alone being about 1·5 tonnes. The bulk of this potentially rich industrial raw material is thrown away as waste at the landing site. The accumulating waste produces offensive smell due to rotting and hence is a source of environmental pollution. Utilization of this waste for the production of chitosan will not only improve the economics of the fishing industry but will minimize pollution hazards.

Chitosan is easily soluble in 1-2% acetic acid without heating and gives a very viscous solution on dissolution. Experiments are in progress to evaluate its use as a glazing material for paper and as a sizing material for printed and coloured fabrics and knitted linens.

Metallurgical Coke from Blends of 'O' Seam Coals with other Coals

At the instance of Bharat Coking Coal Ltd, the Central Fuel Research Institute (CFRI), Dhanbad, undertook studies on the blendability of 'O' seam coal with washed Bhojudih and raw Mohuda coals, all of Jharia coalfield, for production of metallurgical coke.

'O' Seam coal, received from three different collieries, was mixed in equal proportions and the mixture was crushed 100% through 3 mm. Other two coals were crushed 100% through 6 mm. The mixture of 'O' seam coals contained 0·4% moisture, 21·3% ash and 19·7% volatile matter (air-dried basis); Mohuda and Bhojudih coals contained 1·6 and 0·7% moisture, 16·3 and 18·7% ash and 31·5 and 24·1% volatile matters respectively.

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For the preparation of composite blends, blends of washed Bhojudih and raw Mohuda coals were first prepared in 60:40(A); 50:50(B); and 40:60(C) proportions. Composite blends, prepared from 50, 70, 80 and 90% each of the first two blends and 50, 70 and 90% of the last blend in admixture with 50, 30, 20 and 10% of 'O' seam coal mixture in the case of (A) and (B) and 50, 30 and 10% in the case of (C) were subjected to coking tests. Based on the results, four blends were tested in the pilot plants :

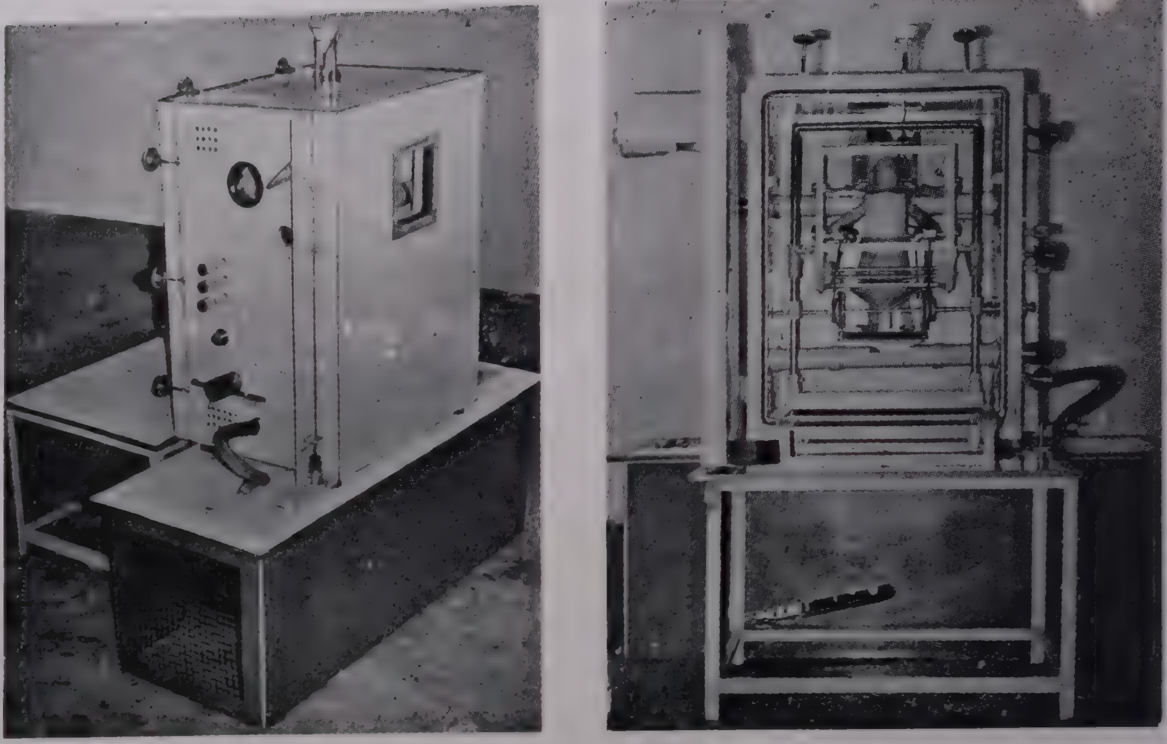
(a) 70% of 'A' and 30% 'O' seam coal;
(b) as above with 0·5% oil on the weight of the blend;
(c) 70% of 'B' and 30% 'O' seam coal; and
(d) as above with 0·5% oil on the weight of the blend.

Of all the blends, (b) appeared to be the optimum blend for steel plant coke ovens. The blend (d) may be suitable for merchant cokeries. A blend containing 50% of (A) and 50% 'O' seam coal (washed as before) may produce coke suitable for blast furnace of smaller capacities (100 tonnes/day or less). But the degradation in the size of the coke during screening and movement may be high.

As most of the coke oven plants are not equipped with such machinaries as to crush coals to the required fineness, blends containing more than 20% of 'O' seam coal may not be suitable for coking. Washed Sudamdih coal (Jharia coalfield) in place of washed Bhojudih coal can tolerate more of 'O' seam coal in blend. Deshaling of 'O' seam coal prior to blending will improve the coke quality.

CSIO Fabricates Chamber for Carrying out Physiological Experiments on Monkeys

A decompression chamber for carrying out physiological investigations on monkeys under simulated conditions of high altitude has been designed and built by the Central Scientific Instruments Organisation (CSIO), Chandigarh, for use by the Department of Physiology of the All India Institute of Medical Sciences, New Delhi. In this chamber, the monkey is seated on a special chair which is rolled into the cabin (600 × 800 × 1100 mm) and the latter closed. When seated on the chair, the monkey's hands and legs can be clamped down without causing discomfort to it. During tests, when the cabin is closed, the monkey's hands can be released for enabling the animal to eat food from outside without breaking the vacuum. Food and water can be served from outside and the left-overs as also excreta can be removed without breaking the vacuum. Twenty-five electrical leadthroughs to pick up various physio-electric signals are provided as also the means for giving light and acoustic stimuli to the monkey.



Decompression chamber for physiological investigations on monkeys; interior of the chamber (right) : CSIO, Chandigarh

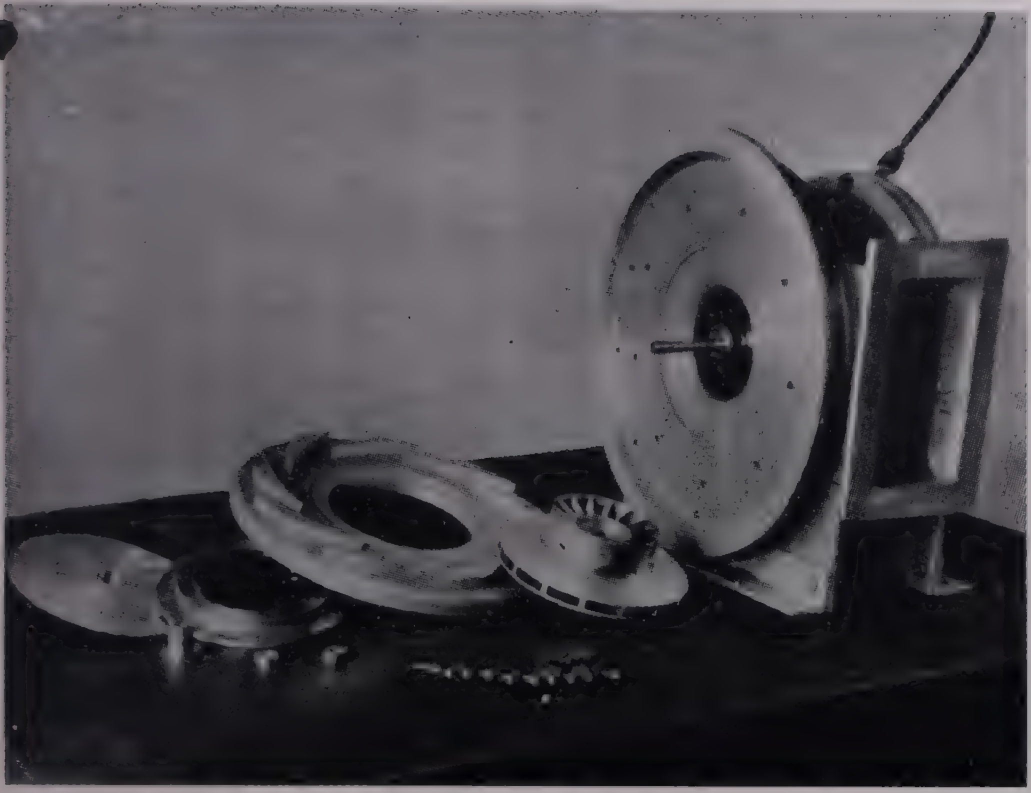
The chamber can be evacuated to simulate lower-pressure conditions corresponding to altitudes of up to 14,000 m and can be cooled down to 5°C. Cooling is achieved by a 1·5-tonne deep freeze unit and the temperature is controlled through hot air circulation. The temperature of the air heated by an electric heater is controlled with a bimetal located in the circulation system appropriately shielded to avoid any electrical pickup by the signal carrying leads. The circulating air is diffused at the entry to the chamber to avoid draft.

A window is provided for visual examination of the monkey, and for the animal to see outside. Thus, it can see pictures projected on to a screen. Extra inlets for letting in gases other than air and also an additional throughport for extra instrumentation are provided.

CMERI Develops Centrifugal Air Compressor

The Central Mechanical Engineering Research Institute (CMERI), Durgapur, has developed a completely indigenous high-speed single-stage centrifugal air compressor. Unique in design, the compressor handles air mass flow at the rate of 0·5 kg/sec at 40,000 rpm at a pressure ratio of 3 at the design condition. The compressor is novel for its design optimization with three-dimensional flow studies and production technique involving the use of simple machine tools.

The compressor will find varied industrial applications in fertilizer industry, and large-tonnage refrigeration and air-conditioning plants for food preservation and storage. In automotive industry, such compressors will



Centrifugal air compressor developed by CMERI, Durgapur

be indispensable for IC engine turbocharger as they match very well both the thermodynamic and structural requirements with inward flow radial type turbines. Such units can also be used as loading devices to the radial turbo-expanders for air liquefaction plants in cryogenic industry. As a new energy source, solar turbines combining with centrifugal compressors of high-speed type have chances of mass consumption as small-power generation units.

Domestic Fuel Requirements in Patna : Collaborative Survey by CFRI

A survey of the domestic fuel requirements in Patna was carried out by the Central Fuel Research Institute (CFRI), Dhanbad, in collaboration with the Department of Industries and Technical Education, Government of Bihar. The aim of the survey was to assess the consumption of different types of domestic fuels in Patna and also to ascertain preference, if any, of the consumers towards a particular type of fuel such as piped gas, kerosene or soft coke.

The survey was done through questionnaires. Representative numbers of households, hotels and restaurants, hospitals and nursing homes, and industrial units were chosen from all the 37 wards of the Patna Municipal Corporation by well-established statistical methods.

The average monthly consumption of various domestic fuels per household is as follows : (i) soft coke—107 to 157 kg; (ii) liquefied petroleum gas (LPG)—less than 5 kg; (iii) kerosene—3 to 4·5 litres; and (iv) fire wood—3·74 to 6 kg. The monthly expenditure on dung cake (dry) per household varies from Rs 3·50 to 5·50 (100 cakes costing Rs 2·00). The electricity consumption figures vary between 15 and 103 units, the most common figures lying between 28 and 50. The seasonal variation in the demand for various fuels is negligible. The fuel bill approximates to 5-10% of the monthly household expenditure.

Based on the above survey, the present annual level of consumption of domestic fuels in Patna has been estimated as follows : (i) soft coke—1,49,300 tonnes; (ii) LPG—2870 tonnes; (iii) kerosene—30,12,000 litres; (iv) charcoal—730 tonnes; and (v) fire wood—16,600 tonnes.

Industrial units, now utilizing about 1375 tonnes of coal and about 1600 tonnes of hard coke per month, indicate definite preference for piped gas.

Assuming no major shift from the existing pattern of fuel utilization because of Government policy decisions and considering a few other aspects, the future demand for domestic fuel in Patna has been estimated. By 1979-80, about 1,26,000 tonnes of soft coke and 3400 tonnes of LPG (equivalent to $9{\cdot}86 \times 10^6$ Nm^3 of piped gas) and by 1984-85 about 1,44,000 tonnes of soft coke and 3900 tonnes of LPG (equivalent to $11{\cdot}31 \times 10^6$ Nm^3 of piped gas) will be the requirements in the household sector alone. The corresponding estimated figures for 1979-80 and 1984-85 respectively for household and corporate sectors (excluding industrial units) together work out to 1,79,000 tonnes and 2,04,000 tonnes of soft coke and about 3700 tonnes (equivalent to $10{\cdot}73 \times 10^6$ Nm^3 of piped gas) and 4200 tonnes of LPG (equivalent to $12{\cdot}18 \times 10^6$ Nm^3 of piped gas).

Even if one considers the rise of demand for domestic fuel on the basis of population growth from 1961 to 1971, it is observed that there is definitely a market for at last 1,70,000 tonnes of soft coke and 3300 tonnes of LPG ($9{\cdot}57 \times 10^6$ Nm^3 piped gas) in Patna in 4-5 years' time.

New R&D Projects on Pesticides at RRL, Jorhat

The current indigenous production of pesticides in India is confined to a narrow range of products, and consequently a huge amount of foreign exchange is being spent on import of a large number of pesticides to meet various end uses. The Planning Commission Task Force (PCTF) and NCST Planning Group on pesticides recommended the development of indigenous technology to enable the country to produce new classes of sophisticated pesticides to meet the requirements of the country in future.

The Regional Research Laboratory (RRL), Jorhat, has taken up R&D work on the development of know-how for the production of Quinolphos and Enolphosphates, the organophosphorus pesticides which occupy a unique position owing to their high systemic action combined with easy degradability and reduced residual effects as compared to chlorinated hydrocarbons.

Quinolphos : Quinolphos is likely to be more efficacious for the control of ball worms in cotton, caterpillar in groundnuts, borers in paddy and diamond moths in vegetables as well as sucking pests in various other crops. The demand for Quinolphos is estimated at 300 tonnes/annum by 1978-79. However, with the gradual phasing out of parathion and endrin, the demand for Quinolphos is likely to rise to 1500 tonnes/annum by the end of the fifth Five-Year Plan. At present, Quinolphos is being manufactured in India only by Sandoz (India) Ltd, Bombay, which is presently producing 200 tonnes/year, and the know-how is imported. The laboratory has taken up this project in collaboration with the Regional Research Laboratory, Hyderabad, where upscaling of the process will be carried out.

Enolphosphates : The demand for pesticides of this group is estimated at 2000 tonnes/annum by 1978-79. Starting from phosphorus trichloride and methyl and ethyl alcohol as the major raw materials and using appropriate coupling component, it is possible to prepare different pesticides such as Gardona, aldrin and phosphomidon. The laboratory is giving high priority to this project.

CSIR Support To Research

New Schemes

Studies in Crystallization : Equipment Design and Performance Evaluation

A CSIR research scheme on the above topic has been sanctioned to Prof. M. R. Chivate (principal investigator), Chemical Engineering Section, Department of Chemical Technology, University of Bombay, Bombay. Crystallization is one of the most complex unit operations encountered in chemical engineering. It involves not only simultaneous heat and mass transfer but also particle dynamics. The main objectives of the present project are to obtain information required in the rational design of industrial crystallizers and to gain a better insight into the mechanism of crystallization practice. Relatively little information is available in literature for a reliable crystallizer design. Crystallization kinetics is complex and unknown for many systems. This project, which aims at standardization of design procedures and scale-up rules, would be of considerable help in developing the know-how in this important operation which is widely used in chemical industry as a purification and separation technique.

In this study, the crystallization kinetics of an industrially important system (containing inorganic salts) will be investigated in a draft-tube baffled crystallizer. The phase equilibria of the selected system along with fundamental system kinetics will be studied. It is also proposed to study the effects of the process variables affecting the performance of the crystallizer. With the known system kinetics and physical parameters the performance of the selected system in the crystallizer will be evaluated by developing suitable mathematical models and will be varified experimentally. On this basis a standardized design procedure would be formulated for an industrial-scale crystallizer.

Anodic and Cathodic Transformations of Organic and Organometallic Compounds

Under a new CSIR research scheme sanctioned to him, Dr R. A. Misra, Chemistry Department, Rajasthan University, Jaipur, proposes to carry out studies on the electrolytic transformations of organic and organometallic compounds. It is proposed to develop a method for dimerization of the methyl half ester of adipic acid to sebacic ester. The effect of various parameters like anode material, concentration, temperature, and current density will be studied in detail to optimize the yield of the product. The studies would be extended to the radical dimerization of some fatty acids.

Nickelacetylacetonate on cathodic reduction to zerovalent state functions as an excellent catalyst, transforming butadiene to novel macrocyclic products in high yields. A similar study is proposed to be carried out in the case of acetylacetonate complexes of other transition elements. Their catalytic behaviour with organic substrates in the organic syntheses would also be evaluated.

Manufacture of Tri-*n*-butyl Phosphate

Tri-*n*-butyl phosphate (TBP) is used in metal extraction, as absorbent for sulphur dioxide, and as a solvent and plasticizer for nitrocellulose and shellac lacquers. *n*-Butanol and phosphorous oxychloride, when taken in homogeneous conditions, give rise to TBP and hydrochloric acid (byproduct). TBP is not being manufactured in India, and the country's requirements for the nuclear fuel complex are met through imports. Under a new CSIR scheme granted to him, Prof. C. Chiranjivi, Head, Department of Chemical Engineering, Andhra University, Waltair, proposes to work out optimum conditions for the manufacture of TBP. The study will include the effect of mole ratio of reactants, solvent, temperature and residence time in batch and continuous processes. Physical methods for separation of hydrochloric acid from the reaction mixture will also be investigated. The reaction mixture containing TBP, unreacted *n*-butanol, and hydrochloric acid will be mixed with water and fed to a packed laboratory distillation column. Butanol-HCl and water would be obtained first and the bottom product would be subjected to vacuum distillation to get TBP. Butanol, obtained from the mixture of butanol, hydrochloric acid and water by a second distillation, would be recycled to the reaction mixture.

Pollution due to Ore-handling Plant at Visakhapatnam

In another CSIR scheme granted to him, Prof. C. Chiranjivi proposes to devise economically feasible methods of preventing dust pollution arising from the ore-handling plant at Visakhapatnam Port. The investigations would be made in three steps; the first step would be the collection of data to assess the fraction of ore that becomes air-borne and thus pollutes the atmosphere. The data would be utilized for carrying out techno-economic feasibility studies of separation techniques in a model ore-loading plant under simulated conditions. Techniques like water spray, agglomeration, electrostatic precipitation and cyclone separation would be tried. The third and the final step would be the studies for disposal of the fines collected.

Port authorities at Visakhapatnam have agreed to assist in solving the pollution problem. The results of the investigation could be utilized for prevention of dust pollution at other ports where ore-handling plants are located.

Non-linear Magnetic Instrumentation

The recently developed high-permeable, low-loss and square-loop type magnetic cores, like permalloy, mumetal, supermalloy and deltamax, have opened up a new field for magnetic instrumentation and control devices. These materials have found uses in many industries, communication systems, automatic controls, earth satellites, geophysical exploration, etc. As magnetic devices are highly reliable even in extreme ambient conditions, high-permeable low-loss cores are used for fabricating precision instruments like dc-to-ac converters, frequency multipliers, voltage-to-frequency transducers, dc instrument transformers, low-flux sensors, magnetometers, and current and voltage comparators.

In a new CSIR research scheme granted to them, Dr S. K. Basu (principal investigator) and Dr S. N. Chakraborty (co-investigator) of the Department of Applied Physics, Calcutta University, Calcutta, propose to explore the potentialities of the subject of non-linear magnetics through some initial theoretical studies and later by development of prototype devices for high-current measurement both for dc and ac applications to a high order of accuracy.

The theoretical studies will mainly concern the loss, hysteresis, sensitivity and noise factors of the magnetic core materials which ultimately limit the accuracy of non-linear magnetic devices. Other important theoretical studies will be on the type of excitation—voltage-source excitation and current-source excitation—and also on the frequency and wave shapes of the excitation voltage or current sources.

Next, it is proposed to develop the magnetic flux-balance sensor. There is a variety of applications of such flux sensors, from null balance indicators for dc current comparators (to be fabricated later) to flux-gate magnetometers for geophysical prospecting. These sensors can also be used as electro-mechanical transducers in industries.

In the final stage, fabrication of direct current comparator and the alternating current comparator will be taken up. Both these instruments can be built to a part per million accuracy and as such can be considered as laboratory standards. Precision measurement of alternating and direct currents at very high ranges is frequently required in industries and laboratories and there is rarely any standard instrument available in the country for the purpose.

The current comparators are practically error-free ratio measuring devices and are self-calibrating type. The ac comparator would be utilized for calibrating laboratory-standard type current transformers. The dc current comparators, on the other hand, would be used for calibrating high-current transductors and shunts.

Completed Schemes

Nature of Glycoprotein-Lectin Interactions

Lectins (phytohemagglutinins) are known to have the unique property of binding with certain specific sugars, polysaccharides and glycoproteins. Although the kinetics of interaction between lectins and sugar have been extensively studied, the nature of binding of lectins with glycoproteins is not well understood. Studies carried out at the Neurology Department, Christian Medical College and Hospital, Vellore, have indicated that glycoprotein-lectin interactions are stabilized both by carbohydrate-protein interaction and by protein-protein interaction. Since the glucose oxidase from *Aspergillus niger* is a glycoprotein and acts specifically on glucose, which is also a concanavalin A-specific sugar, it was considered of interest to see the extent to which the stability of the concanavalin A-glucose oxidase complex was contributed by protein-protein interactions and how the stability was affected by the substrate glucose. These studies were made by Shri D. Thambi Dorai, a CSIR research fellow, who worked at the Department from June 1973 to June 1975. It was found that glucose oxidase forms an enzymatically active complex with concanavalin A, which can be dissociated by α-methyl-D-glucoside. The dissociation was found to be pH-dependent. The stability of the complex was studied by using the parameters of pH, ionic strength and the concentration of α-methyl-D-glucoside. It was also found that the complex could be reused several times without appreciable loss of activity. The results obtained strengthen the view which has been established in this laboratory on the nature of glycoprotein-lectin interactions.

A detailed study on the nature of alkaline phosphatases from sheep brain is currently under progress. The isoenzymic nature of the alkaline phosphatase from sheep brain has already been established in this laboratory. However, more far-reaching goals like survival of glycoprotein enzymes in circulation, role of their carbohydrate moieties on their catalytic activities, nature of the carbohydrate constituents of the enzymes of the brain, immunological characterization of the isoenzymes and enzyme distribution in the brain cell populations make it very essential that the isoenzymes be isolated and characterized in a homogeneous state. One of the isoenzymes of alkaline phosphatase has been purified to near homogeneity, using such procedures as butanol extraction, alcohol precipitation, Sephadex G-200 gel chromatography, and ion-exchange chromatography on DEAE-Sephadex.

Physico-chemical Studies of Membranes for Reverse Osmosis

Cellulose acetate (CA) is a highly suitable polymer for the preparation of semipermeable membranes generally used in the reverse osmosis (RO) process. So far, RO membranes have been prepared and studied using cellulose acetate manufactured by Eastman Chemical Product Inc. (USA). Since this material is to be imported and the membranes prepared using it would be very expensive, preparation of these membranes using cellulose acetate manufactured in India by Mysore Cellulose Acetate and Chemicals Ltd was undertaken by Shri R. M. Kawa under the guidance of Dr D. J. Mehta at the Central Salt & Marine Chemicals Research Institute, Bhavnagar. The effect of the following parameters on the preparation and performance of the membranes has been studied :

(i) compositional parameters—variation of polymer and swelling agent contents;
(ii) casting parameters—post-cast evaporation time, casting temperature, and annealing treatment temperature;
(iii) environmental parameters—relative humidity; and
(iv) operational parameters—applied pressure, feed velocity, and feed salinity.

The membranes prepared from the casting dope, containing cellulose acetate (20%), formamide (30%) and acetone (50%), by giving a post-cast evaporation time of 30 to 90 sec. at a relative humidity of not more than 80% when annealed at 86-87°C for 15 min gave suitable RO membranes. With the membranes so prepared, variation in operational parameters was studied and it was found that the optimum product water flux and salt rejection could be obtained by passing the feed containing 5000 ppm sodium chloride at the rate of 3·5 litres/min under a pressure of 600 psi.

The casting technique for the fabrication of the membranes has also been modified. The effect of variation in the preparatory conditions given under compositional, fabricational and environmental parameters on the membrane water content, bound water content, electrical resistance and shrinkage in area has also been studied and the variation in the performance of different membranes has been explained on the basis of the above-mentioned physico-chemical properties.

The performance data of the membranes having different gross thicknesses have been collected and the thicknesses of the active layer of the RO membranes have been calculated.

The corrosion of aluminium tubes used as membrane support and other accessories of the RO plant has also been studied.

The data collected are useful for the preparation of reverse osmosis membranes using indigenously available cellulose acetate. The performance of the membrane can be predicted directly from some of the physico-chemical properties.

Shri Kawa was awarded the Ph. D. degree by the Saurashtra University for his thesis based on the studies.

Behaviour of Supports and Surrounding Strata in Longwall Workings

A knowledge of the different parameters affecting the behaviour of supports and surrounding strata is of paramount importance to the application of longwall system on a large scale in Indian coalmines for increasing the production of coal.

Hence, the behaviour of supports and surrounding strata in longwall workings has been studied by Shri Naresh Chandra Saxena at the Central Mining Research Station (CMRS), Dhanbad, under the guidance of Dr B. Singh, Coordinating Scientist (CMRS), Dr S. S. Saluja, Director, Institute of Technology, Banaras Hindu University (BHU) and Dr M. P. Naterwala, ex-Principal, College of Mining and Metallurgy (BHU). Investigations were carried out in ten longwall faces.

For the success of longwall system of coal extraction it is necessary to have a properly chosen support system with adequate support resistance. A method for calculating the support resistance requirement for longwall faces has been worked out.

Wooden props are extensively used in coalmines for supporting the roof strata. A relationship, $P=47{\cdot}2-1{\cdot}5h/d$, has been derived where P is the load bearing capacity of *Shorea robusta* props in tonnes, and h and d are the height and diameter respectively.

The nature of loading of wooden props at hydraulically sand-stowed longwall faces was investigated and it was found that these props did not offer a uniform resistance to the strata which is essential for effective strata control. Hence, it was recommended that as far as possible yielding props should be preferred to wooden props at longwall faces.

The convergence as well as props load at both the hydraulically sand-stowed and caved faces were found to show a tendency of periodic increase at the faces where the overlying strata were not disturbed in advance due to either natural or operational causes. This phenomenon is known as periodic weighting. At a caved face, a maximum convergence of the order of 26·8% of the working height occurred during the first major weight period. At the faces which experienced periodic weights, maximum convergence as well as prop load occurred during these periods. The increase in mean time-based load density during periodic weights was 23-29% of that during normal periods at three caved faces. On this basis it was recommended that while calculating support requirement for longwall faces by the method recommended, a minimum of 50% reserve capacity over the calculated value should be provided for the faces where periodic weights are expected. The intensity of periodic weights was found to be more at caved faces than at stowed ones, whereas the interval between periodic weights was more in the latter cases.

The control of strata during the first major weight is the most important operation in caved longwall faces. A relationship between the length of longwall face (y in m) and the distance (x in m) at which the first main weight can be expected in caved faces of length between 60 and 90 m has been derived: $y=142{\cdot}8-1{\cdot}41\,x$.

The investigations have revealed that in general about 2-3% convergence can be expected at hydraulically sand-stowed faces and it is better from the point of view of strata control to lay these faces along dip-rise direction. It was also found that at caved faces a convergence of less than 10% can be expected during normal periods.

The mean time-based load density (y in tonnes/prop) and convergence per metre of thickness per metre of face advance (x in mm) were found to follow a power law relationship at a caved longwall face, as given below:

$$y = 5{\cdot}053\,x^{0{\cdot}27}$$

The zone of maximum influence of front abutment was found to be more in caved faces than in stowed ones.

Shri Saxena recommended the equation $y=a\,(1-b^{x-c})$, based on his findings, for calculating convergence in gate roads behind hydraulically sand-stowed faces, where y is convergence per metre of thickness in millimetres; x is distance from the face in metres; c is initial distance of measuring station from the face; and a and b are constants. The value of a is governed by the sum of face convergence and compression of the stowed material in the goaf and b depends upon the initial distance c of the measuring station from the face. The value of b is always less than one, and when c is zero, b is equal to 0·999. This relationship can also be used for calculating the distance behind the face in gate roads at which the effect of face advance virtually ceases.

It has been found that the pressure in stowed goaf depends upon the width-depth ratio of the excavation and the efficiency of stowing is better in dip-rise faces than in strike ones.

Shri Saxena was awarded the Ph. D. degree in mining engineering by the Banaras Hindu University for his thesis based on the studies.

PATENTS ACCEPTED

Indian Pat. 135278

A novel system for ignition and flame stabilization in afterburners and duct burners of aircraft engines

K. Sivashankaram & P. A. Paranjpe
National Aeronautical Laboratory
Bangalore

Afterburners and duct burners are used on aircraft engines to augment the thrust during take-off and manoeuvres, by burning additional fuel. The essential feature of this invention is to provide a simple ignition and flame stabilization system for afterburners and duct burners which would provide reliable operation even under low temperature and pressure conditions in the afterburners and also reduce the fuel consumption of the engine.

The patented system overcomes the the shortcomings of the currently employed ignition techniques, which are listed below along with their disadvantages :

(1) The pilot chamber ignition technique is bulky and needs a reliable electrical ignition system and cannot be applied to duct-burning engines.
(2) The hot streak ignition is not quite suitable for engines with multiple turbine stages, and cannot be applied to duct-burning engines; moreover, the turbine blades are subjected to a thermal shock during ignition.
(3) The catalytic ignition becomes unreliable at low temperatures and pressures encountered at high altitudes and part-speed operation.

In addition to eliminating the above disadvantages, the innovation covered by this patent avoids the use of bluff bodies in the afterburners/duct burners for flame stabilization and thereby reduces the specific fuel consumption of the engine under non-augmented mode.

The patented system essentially consists of remotely operated bleed valves to tap out air or gas at the appropriate location on the compressor or combustion chamber and feed it into a bleed duct during afterburner operation. The bleed duct comprises a vortex tube (also called Ranque-Hilsch tube) which raises substantially the temperature of the portion of gas. Fuel is injected into this heated air/gas in the presence of catalyst, causing spontaneous combustion. Hot flaming gases are then reintroduced as jets at the appropriate angle into the duct burner or afterburner continuously during augmented mode to provide a continuous source of ignition and thereby stabilize combustion. The catalyst and/or the vortex tube could be optional elements depending on the type of the engine and the bleed-off location on the engine.

The system covered by this patent is suitable for high compression ratio engines (pressure ratio exceeding 18) as employed currently on transonic aircrafts. The superiority of this system is by way of reduction in fuel consumption in dry (non-augmented) mode of operation and improved reliability of ignition under lower temperatures and pressure in the duct burners/afterburners.

PATENTS FILED

546182 : USA (corresponding to Indian Pat. 2636/Cal/74) : Preparation of new, pharmacologically active compounds, C. K. Atal, O. P. Gupta, R. S. Sawhney, M. Ali, B. J. R. Ghatak & R. K. Thappa—RRL, Jammu.

546183 : USA (corresponding to Indian Pat. 1531/74) : A process for the production of metol (N-methyl-*p*-aminophenol sulphate), R. C. Rastogi & J. N. Baruah—RRL, Jorhat.

2505/Cal/74 : An improved method for clamping teflon foils in an electret microphone, P. K. Chakraborty, M. R. Kapoor, F. Singh & K. D. Pavate—CEERI, Pilani.

Bangladesh Team Studies CBRI School Project

A three-member delegation led by Shri Ataul Haque, Joint Secretary, Ministry of Education, Scientific & Technological Research and Atomic Energy, Bangladesh, visited the Central Building Research Institute (CBRI), Roorkee, from 10 to 13 July 1975. The team was taken round the laboratory and some of the school buildings constructed by CBRI in Roorkee subdivision. The members of the delegation were appreciative of the buildings and the method of construction devised by the institute. They held discussions with CBRI scientists on its school building project.

Shri Haque felt that the experience gained by CBRI in the construction programme and the technique of quick construction could be utilized with some modifications to suit the conditions in Bangladesh, which proposes to build 5000 primary school buildings during its Five-Year Plan ending 1978 and for which a sum of one crore takas has been earmarked. He also expressed the hope that CBRI's experience would go a long way in helping Bangladesh construct economic school buildings.

Symposium on Industrial Toxicology

An international symposium on Industrial Toxicology will be held at the Industrial Toxicology Research Centre, Lucknow, from 4 to 7 November 1975. The object of the symposium is to evaluate the present status of research in the field of industrial toxicology and to define the areas for future research. Technical sessions will cover : (1) Survey studies and epidemiology, (2) Toxicology of industrial dusts, (3) Toxicology of industrial chemicals, (4) Toxicology of agricultural chemicals, (5) Toxicology of metals, (6) Collection, storage and dissemination of toxicological information, and (7) Prophylaxis and therapy.

Intending participants are invited to present papers on the topics indicated above. The date-line for receipt of titles and abstracts of papers is 15 September 1975. Further information can be had from : The Director, Industrial Toxicology Research Centre, Mahatma Gandhi Marg, Post Box No. 80, Lucknow 226001.

Research and Industry Get-together : CSMCRI

A get-together of directors and scientists of national laboratories, representatives of industries and officials of Gujarat Government will be held on 27 September 1975 at the premises of the Gujarat Chamber of Commerce & Industry, Ahmedabad. The get-together, being organized jointly by the Gujarat Chamber of Commerce & Industry and the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, will discuss the areas of research and development in the fifth five-year plan programmes of Gujarat State. A report on these R & D areas has already been prepared by CSMCRI. The report has screened the problems, especially technical, and earmarked the national laboratories which can solve them either by themselves or through interaction with industries or government departments.

Further details regarding the get-together can be had from : The Director, Central Salt & Marine Chemicals Research Institute, Bhavnagar 364002.

PERSONNEL NEWS

Dr Baruah Appointed Scientist 'F'

Dr J. N. Baruah has been appointed Scientist 'F', Regional Research Laboratory, Jorhat. He took charge on 30 May 1975.

Dr Baruah (born 2 March 1931) obtained his M. Sc. degree from the Calcutta University in 1953, and Ph. D. from the Texas Agricultural and Mechanical University in 1959. He worked at the Assam Medical College, Dibrugarh, as Head of the Department of Biochemistry and Chemistry during 1960-61, before joining RRL, Jorhat, as Senior Scientific Officer. He organized the biochemistry division of the laboratory and was placed as head of the division. Recipient of an FAO Andrew Mayer fellowship, Dr Baruah carried out postdoctoral research at Massachusetts Institute of Technology, Cambridge, on hydrocarbon fermentations. Since 1972 Dr Baruah has been heading the Organic Chemistry Division of RRL, Jorhat. He has conducted researches in natural products chemistry, biochemistry and fermentation technology. He has to his credit more than 75 papers and many patents taken in India and foreign countries. Dr Baruah is a Fellow of the Royal Institute of Chemistry, London, and Chemical Society, London. He is also a member of many national and international professional societies.

* * *

Sarvashri A.P. Baruah, B.C. Borthakur and V. N. Gupta have been appointed Scientists 'B', Regional Research Laboratory, Jorhat, with effect from 8 July 1975.

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CSIR's Exhibition on Indian Science and Technology in Bulgaria

The Council of Scientific and Industrial Research organized an Exhibition on Indian Science and Technology from 19 to 28 May 1975 at the Youth Hall in Sofia. Organized under the agreement for science and technical cooperation between CSIR and the State Committee for Science, Technical Progress and Higher Education of the People's Republic of Bulgaria, the exhibition was the first of its kind organized by CSIR in a foreign country. Besides CSIR and its laboratories and cooperative research associations, the Department of Atomic Energy, Indian Institutes of Technology, and the Indian Institute of Science took part. Public sector undertakings like Hindustan Machine Tools and Indian Telephone Industries Ltd and scientific equipment firms also participated in the exhibition. A similar exhibition, including scientific lectures and film shows, had been organized by Bulgaria in Delhi in February 1974.

The exhibition at Sofia was inaugurated by Mr Nacho Papazov, Chairman, State Committee for Science, Technical Progress and Higher Education, who in his inaugural address said that the relations between Bulgaria and India were a model of understanding and mutual striving for peace and friendship. The exhibition would further help in the task, he said.

Mr Nacho Papazov, Chairman, State Committee for Science, Technical Progress and Higher Education of the People's Republic of Bulgaria, inaugurating the Indian Science and Technology Exhibition in Sofia

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, in his welcome address said that the exhibition would enable the scientists and specialists from the two countries to complement, supplement and exchange their experience and knowledge concerning the development of science and technology.

Mr Stanko Todarov, Prime Minister of Bulgaria and Mr T. Chakarov, Minister for Industries and Co-chairman, Indo-Bulgarian joint commission, who visited the exhibition, spoke highly of India's scientific and technical capability. The Bulgarian Prime Minister felt that the exhibition would be instrumental in promoting Indo-Bulgarian friendship and would help expand scientific and technical cooperation between the two countries.

All the exhibits included in the exhibition were indigenously developed and manufactured. The entire exhibition was divided into eight major sections relating to : atomic energy, electronics and communication, instruments, metals and materials, drugs and chemicals, food and beverages, fabrics, and publications, besides miscellaneous items. The visitors evinced keen interest in instruments like the foetus monitor, electronic moisture meter, digital clock, oscilloscopes, photostat copying machine, and optical and laser glass. HMT watches were a great attraction.

The exhibition aroused considerable interest in Bulgaria and other East European countries and made a deep impression on the people with regard to the progress of Indian science and technology. Requests are being received by CSIR for organizing similar exhibitions in that region.

Prof. Nayudamma also led the Indian delegation to the fourth session of the Indo-Bulgarian joint sub-commission held during 20-24 May 1975. The other members of the delegation were Dr A. R. Verma, Director, National Physical Laboratory, New Delhi; Dr G. Thyagarajan, Director, Regional Research Laboratory, Jorhat; Dr T. N. Khoshoo, Scientist-in-charge, National Botanic Gardens, Lucknow; Shri K. N. Johry, Head, International Collaboration, CSIR, New Delhi; Dr C. V. S. Ratnam, Managing Director, National Research Development Corporation of India, New Delhi; and Dr (Smt) R. Ramachandran, Department of Science and Technology, New Delhi. Drs Verma, Khoshoo, Thyagarajan and Ratnam also delivered special lectures at the Academy of Sciences, Bulgaria.

A protocol for the year 1975-76 was finalized which includes cooperation in the field of ore beneficiation, corrosion research including corrosion in oil pipelines, food technology, industrial microbiology, ionospheric research, and medicinal plants and essential oil bearing plants. A programme of cooperation was finalized in the field of aromatic rose and aromatic culture, aromatic and medicinal plants—an area in which Bulgaria has acquired considerable expertise. A note of understanding was also signed on the utilization of patents and know-how between NRDC of India and the Committee for Science and Technology, Bulgaria. While Bulgarians showed interest in the Indian products and processes mentioned above, they offered to India some of the processes developed by them, e.g. electrolytic refining of copper and counter-gas pressure casting techniques.

Electrolytic Iron Powder from Iron Chloride Solution

Bhubaneswar Laboratory's Process

The Regional Research Laboratory, Bhubaneswar, has successfully developed a process for producing electrolytic iron powder from iron chloride solution on a bench scale. About 200 g of iron powder of more than 99·5% purity has been prepared in the laboratory.

The process consists in converting the acid-free iron chloride, obtained either as leach liquor from hydrochloric acid leaching of ilmenite or from any other metallurgical or chemical industries, wholly to ferrous chloride. This ferrous chloride is used as a catholyte and saturated sodium chloride solution is used as an anolyte. The anode and cathode chambers are separated by a suitable porous diaphragm. Stainless steel sheets and graphite are used as cathode and anode respectively. Some additives are added to the catholyte to make electrolysis continuous and also for obtaining high-purity iron powder. The iron deposited is removed in the form of brittle flakes, which are subsequently ground to the desired size.

Iron powder is used in automobile, electrical, electronics and metallurgical industries, and the byproduct chlorine is used in paper, rare earth metal and other industries.

Estimation of Fly Ash Content in Hardened Mortars and Concretes : CRRI's Method

Fly ash is the cheapest and the most versatile of all pozzolanas. It has been widely recommended as a part substitute to cement or sand in mortars and concretes to the extent that it does not jeopardize their quality. It is, however, important to check if the content of fly ash in mortars and concretes is within the prescribed limits from the viewpoint of the strength of the mix. A method for estimation of fly ash with a good degree of accuracy is therefore required. At present, there seem to be only two methods, viz. (i) the Japanese method using picric acid in methyl alchohol for approximate determination of pozzolana content in portland pozzolana cement, and (ii) the microscopic method developed in Germany for estimation of fly ash in mortars and concretes. The Japanese method cannot be extended to mortars and concretes, and the German method is approximate and at best only qualitative.

Studies conducted at the Central Road Research Institute (CRRI), New Delhi, have led to the development of a 'difference' method based on the determination of HCl-soluble and HCl-insoluble silica contents in the mortar as well as individually in the constituents thereof, namely cement, sand and fly ash. The method yields a good degree of accuracy (± 6%), and can be used for determining fly ash content in concretes also. For better accuracy, it is necessary to obtain samples of individual materials actually used in the mortar or concrete. The method is applicable to both hydraulic and non-hydraulic types of fly ash.

Sweetening of Crude Oils : Process under Development at IIP

Crude oils containing sulphur yield on refining, products containing sulphur compounds, viz. mercaptans, sulphides, cyclic sulphur compounds, and free sulphur. These sulphur compounds impart a foul odour and adversely affect the product quality, i.e. octane number. The process of sweetening improves product quality by the removal of mercaptans or conversion of these compounds to less deleterious disulphides. Other advantages of sweetening are colour stability, lesser corrosion of refinery equipment, reduced catalyst poisoning and economy in the use of additives such as tetraethyl lead in gasolines. To meet the demand for the petroleum products, cheaper crudes having high sulphur content are likely to be imported. The Indian Institute of Petroleum (IIP), Dehra Dun, has taken up work on the development of indigenous technology for sweetening. The institute has synthesized a catalyst of the phthalocyanine group for oxidation of mercaptans to disulphides. The catalyst can be used either as its solution in an alkali or as such when supported on carbon. Experiments conducted with the catalyst in alkali on

Darius naphtha (IBP-150°C cut), having mercaptan sulphur content of up to 139 ppm, reduced the mercaptan content to 8 ppm.

For studying the fixed-bed sweetening, a micro unit made of glass and charged with indigenous activated carbon impregnated with an alkaline solution of the catalyst was used. Darius cut (150-300°C) containing 230 ppm mercaptan sulphur was percolated through the bed at ambient temperature and at a flow rate of 300 ml/hr and an air pressure of 25 psi; the mercaptan content in all the percolates was less than 5 ppm. These trials show that the efficiency of the IIP catalyst is comparable to that of the imported commercial catalyst. Further work relating to bulk preparation of the catalyst and scale-up studies is in progress.

Counter/Frequency Meter : CSIO

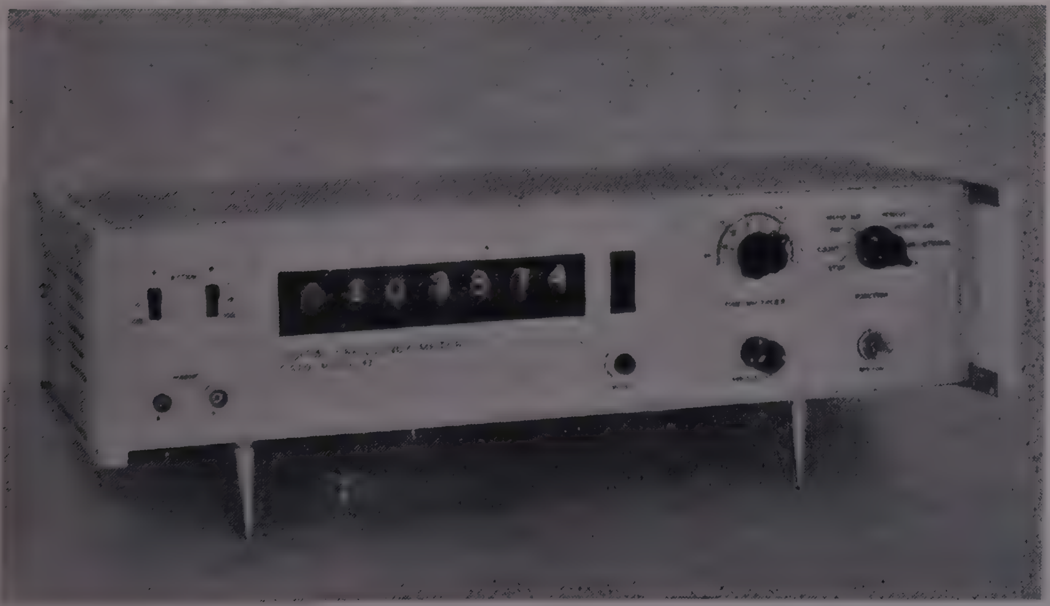
A versatile counter/frequency meter (20 MHz) has been designed and fabricated by the Central Scientific Instruments Organisation (CSIO), Chandigarh, using the latest technology and integrated circuits. It is compact, lightweight and reliable. The input circuit provides high input impedance and operates at low input signal. The attenuator provided in both channels can attenuate signals from 1 to 100 in decade steps. The seven digits nixie readout with memory latches provides flicker-free numerical display. It has six basic modes of operation : frequency, frequency ratio, period, period average, time interval, and count. It can measure time intervals up to 100 ns and is provided with an autocheck facility. The instrument has wide applications in production, research and other fields.

The instrument compares an unknown frequency or time interval with a known standard frequency or time interval and presents this information in an easy-to-read unambiguous numerical display. Better accuracy and improved reliability are obtained with the use of electronic switching. The time base of the instrument consists of a crystal-controlled oscillator. The accuracy is 1 part in 10^6 in 24 hours and it oscillates at 10 MHz frequency.

The input to be measured is attenuated, amplified and shaped by Schmidt trigger. The conditioned signal passes through the main gate for a time interval determined by gate control circuit. The gate control circuit derives its time interval signals from an accurate time base. Gate control circuit is subject to manual control by a switch which determines the operating mode of the counter. Signal pulses determined by the counting mode are fed to the decade counting unit and are displayed.

Specifications

Frequency range : 0 to 20 MHz
Period range : 0 to 10 MHz
Period average : 0 to 20 MHz
Time interval : 100 ns to 10^7 sec
Channel A : dc to 20 MHz
Channel B : dc to 1 MHz
Frequency ratio : A/B
Input impedance : 1 megohm
11·25 pF
Sensitivity : 100 mV peak to peak
Accuracy : ± 1 count
± time base accuracy
Gate time : 0·1 μsec to 1 sec



Digital counter/frequency meter designed and fabricated by CSIO, Chandigarh

Protein and Vitamin Concentrate from Petroleum Hydrocarbons

Petroleum-derived single-cell protein (SCP) has emerged in recent times as one of the best sources of protein to overcome the world's protein shortage. In India, it is possible to produce annually about 0·12 million tonnes of pure protein by diverting 5% of the internally derived crude.

Shri P. K. Barua of the Regional Research Laboratory (RRL), Jorhat, has carried out studies on the cultivation of yeast on petroleum hydrocarbons for the production of protein and vitamin concentrate. Of the various types of organisms which utilize petroleum hydrocarbons, yeasts were selected in the present study because of simplicity of their separation from the fermentation broth. Two yeast strains were isolated from soil samples of the oilfields of the Assam Oil Company, Digboi. Studies on isolation, morphological and biochemical characteristics of the two yeast strains along with their growth on different hydrocarbon substrates were made in detail. Based on taxonomical characteristics the yeast strains were identified as *Trichosporon pullulans* RAY13 and *Endomycopsis lipolytica* Y13A. Both the yeast strains grew well on gas oil (bp 250-350°C) which was found to be a better carbon source than diesel oil and white kerosene.

The nutrient requirements of *T. pullulans* RAY13 were studied for selecting the optimum concentration of each of the nutrients in order to produce maximum biomass during the oxidation of gas oil. Studies on growth factor requirement by the yeast *T. pullulans* RAY13 showed that vitamins like thiamine, riboflavin and pyridoxine were necessary in the basal medium for the optimum growth of the organism.

Utilization of normal and iso-paraffins, separately and in mixture, by *T. pullulans* RAY13 was investigated. From a mixture of normal and iso-paraffins the organism consumed straight-chain paraffins, leaving the branched paraffins relatively unchanged. When offered separately, the highest utilization of *n*-alkanes by the organism was obtained in the range of undecane to octadecane; *n*-pentadecane was poorly utilized. From a mixture of *n*-alkanes, the rate of consumption of shorter-chain alkanes, *n*-decane to *n*-dodecane, was found to be relatively faster and more uniform than that of longer-chain alkanes. The generation time of *T. pullulans* RAY13 on individual *n*-alkanes varied from 3·4 to 9.9 hr. The specific growth rate of *T. pullulans* RAY13 on paraffin mixture was found to be 0·27 hr^{-1}, and 88% cell yield was obtained.

For the purpose of producing yeast cells from gas oil, the effect of several growth parameters such as volume fractions of gas oil, pH, temperature and levels of mineral medium concentration were investigated in a 3-litre air-lift type fermentor. Favourable cultural conditions were ascertained for the growth of *T. pullulans* RAY13. The specific growth rate varied from 0·17 hr^{-1} to 0·23 hr^{-1}. The optimum pH and temperature of growth were found to be 4·5 and 28°C respectively. The activation energy was found to be 11·2 kcal/g mol. for *T. pullulans* RAY13 grown on gas oil. At 10% gas oil concentration, cell yield obtained was 62% on the basis of oil consumed.

Batch cultivation of an ascosporogenous yeast *E. lipolytica* Y13A was carried out in a 18-litre working capacity air-lift type fermentor at varying volume fractions of gas oil. The experiments were also designed by varying the inoculum size, and its effect on the growth of yeast was studied. The dissolved oxygen level in the aqueous phase was also investigated during the course of fermentation. At 4% and 12% volume fraction of gas oil, linear growth was observed, whereas at higher volume fraction of gas oil (24% and 35%) exponential growth was predominent. The cell concentration at the transition time for exponential phase to linear phase increased with increase in volume fraction of gas oil, indicating that in air-lift type fermentor the availability of the interfacial area is largely determined by the dispersed phase volume fraction. The cell yield varied from 60 to 70% at different volume fractions of gas oil. The effect of inoculum size was also investigated by varying the inoculum size from 0·1 to 2·5 g/litre. The specific growth rate decreased from 0·22 hr^{-1} to 0·10 hr^{-1} with the increase in inoculum size at 10% volume fraction of gas oil. The length of exponential phase was found to be dependent on inoculum size.

The nutritive value of SCP obtained at different cultural conditions was assessed. The crude protein content varied from 51·7 to 60%. SCP obtained from gas oil was rich in essential amino acids with the exception of the sulphur amino acid methionine, which was found to be low as compared to FAO reference protein. Vitamins content of SCP was found to be low as compared to Torula type yeast. The mineral contents of SCP, especially calcium and phosphorus, were high. This is an additional advantage for the supplement of SCP in cereals.

The work was carried out under the guidance of Dr J. N. Baruah, Deputy Director of the laboratory and Prof. S. K. Majumdar, Jadavpur University, Calcutta. Shri P. K. Barua was awarded the Ph.D. (Engg) degree in food technology and biochemical engineering by the Jadavpur University (1975).

Progress Reports

NAL Annual Report : 1973-74

The annual report of the National Aeronautical Laboratory (NAL), Bangalore, for 1973-74 shows that the laboratory laid stress on the aerospace field on two fronts (i) forward-looking research to establish capabilities in a variety of areas (primarily related to airframe), and (ii) interacting with the industry and R & D organizations on problems of immediate and specific interest. The laboratory participated in the performance analysis and related studies in connection with the evaluation of flight safety of HS-748 aircraft.

Aerodynamic testing of various models of aircraft, space launch vehicles, etc. was undertaken both in the 4-ft trisonic wind tunnel and 1-ft trisonic wind tunnel for the Defence R & D Organization, the Hindustan Aeronautics Ltd and the Indian Space Research Organization, the number of test runs being 678 in 4-ft tunnel and 820 in 1-ft tunnel.

A shock tube (75 mm × 75 mm) facility was commissioned. The facility is designed for the study of high-enthalpy flows and aerodynamic heating of high-speed aerospace vehicles.

A series of conventional and supercritical two-dimensional aerofoils were designed for being tested in the 1-ft tunnel at high subsonic speeds. Preliminary tests were carried out on a typical supercritical profile, mainly to gain familiarity with the aerodynamic features of such aerofoils, and also to check the experimental techniques. A computer programme for calculating the supercritical flow past aerofoils was developed. Competence in this area is important for the design of shockfree aerofoils.

The low-speed cascade tunnel (test section, 150 mm × 300 mm) was used for cascade tests up to an inlet Mach number of 0·5. This tunnel provided valuable design information for better optimization of turbine blade profiles. The tunnel was also used for investigating new concepts of blade profiles based on theoretical studies and for generating design data pertaining to flow loss. A high-speed cascade tunnel with a section of 150 × 500 mm and with an inlet Mach number range of 0·7-1·5 was being set up; this tunnel would provide design data for high-speed axial flow turbomachines.

A turbine research rig, built around a hydraulic dynamometer which can absorb 1650 hp in the speed range of 12,000-26,000 rpm, was commissioned. This is a unique facility for undertaking investigations on model turbine stages of widely varying configurations. A high-speed compressor research rig was also being set up to achieve high pressure rise per stage.

The combustion and gasdynamic facility provided a continuous source of air at variable pressures and temperatures to undertake experimental investigations pertaining to hot components of the engine. Work on catalytic and pyrogenic ignition in afterburners and development of fluidic temperature sensor was completed successfully.

The capability developed in fatigue and fracture is of prime interest to the aeronautical industry. Fatigue testing on an aircraft was under way. A creep rupture machine and another machine for creep-crack propagation were designed and fabricated.

Using the electron beam furnace set-up, various experimental titanium alloys were melted and optimum melting conditions were established. An arc furnace for melting titanium alloy buttons and fingers was built. Facilities for melting experimental aluminium and magnesium alloys were established. A machine for drawing wires of experimental alloys was designed.

A 55-ft FRP radome was designed and its fabrication was taken up for use by the Defence establishments. A transportable shelter for electronic equipment was made for the Bharat Electronics Ltd.

An aeroelastic model (1/10 scale) of high-speed fighter aircraft wing, designed to match the characteristics of 4-ft trisonic tunnel, was tested at Mach number 1·8 and for a range of dynamic pressures. The model failed during the stopping operation of the tunnel mainly because of unequal movement of proximity plates. Improvements on model fabrication as well as necessary modifications of the proximity plates of the tunnel were worked out.

A 1/10 scale model representative of a typical agricultural aircraft wing was designed. Aeroelastic testing of a typical satellite launch vehicle was taken up. Models were being designed to study the divergence of vehicle body and also flutter of the fin.

In the field of instrumentation, NAL was primarily engaged in the development of electrical sensing devices and associated instrumentation for measurement of aerospace parameters and multidisciplinary control systems for aeronautics, including a motion-base simulator for pilot behaviour studies. A 1/3 scale, full-functional model of the motion-base flight simulator was successfully designed, developed and commissioned. The unit, capable of carrying weights up to 500 lb, was being used to assess pilot performance with motion cues.

A digital panel meter of $3\frac{1}{2}$ digit (200 mVFS) with auto zero and auto polarity was designed and developed. A laboratory prototype of an automatic digital IC tester was developed for testing different types of TTL integrated circuits; about 1000 IC's could be tested per hour. Other important digital devices/systems built during the year include a 100-channel data logging system for the Roorkee University, a high-current ammeter calibrator, a programmable temperature controller for a 15 kW oven, and 3 raingauge telemetry systems for the India Meteorological Department.

A project report on the development of a computer system for Bangalore region as part of the National Computer Programme was prepared for consideration by UNDP. Based upon aerofoil data submitted by HAL, machine settings were computed on the SIRIUS computer for making an integrated wing model on a jig-borer, employing the tangent-milling technique. Linear programming techniques were applied to data supplied by the Central Food Technological Research Institute, Mysore, for determining the best and most economical food mix conforming to FAO standards. A computer programme to simulate an airborne computer was developed in FORTRAN.

Three patents were filed and 44 research papers were published during the year. Against total financial inputs of Rs 17·18 million the income of the laboratory during the year amounted to about Rs 6·51 million.

CDRI Annual Report : 1973

The annual report of the Central Drug Research Institute (CDRI), Lucknow, for 1973 records the steady progress the institute has made in its eleven long-term projects. The total financial inputs during the year amounted to Rs 7·182 million, comprising a recurring expenditure of about Rs 6·642 million and a capital expenditure of about Rs 0·540 million.

Work on two sponsored projects relating to the development of economic processes for amitryptiline, an important anti-depressant drug, and D-propoxyphene, an analgesic, was completed. Processes were standardized on bench scale for the preparation of stable fibrinogen from bovine and human plasma, and of pepsin from buffalo and goat stomachs. A microbiological process was also standardized on a small scale for the production of L-lysine using a suitable homoserine auxotroph of *Micrococcus glutamicus*.

The method for production of protein hydrolysate from oil cake, developed earlier, has been improved by eliminating the stage of peptization and protein separation.

The first phase of the efficacy trials of Centsquare, an intravaginal contraceptive device developed earlier by CDRI, has been completed. The results of the trial covering a total of 7015 cycles and extending over 14 months indicate that Centsquare is an acceptable local contraceptive with an efficacy of 81% according to the Pearl index.

Two propionic acid derivatives were found to be cent per cent effective in preventing pregnancy in rat when administered orally in single dose postcoitum.

Clinical trial (phase II) of Centazolone, a new tranquillosedative, in a limited number of patients with symptoms of neurotic illness and predominant effect of anxiety, showed varying degrees of clinical improvement in a majority of cases. No major side-effect was observed.

Centbucridine, a new local anaesthetic, under phase II clinical trial was found to produce more intense and longer-lasting effect than lignocaine when given by infiltration and spinal routes. Infiltration with 0·25 and 0·5% of the anaesthetic produced adequate anaesthesia for surgery. There was no post-operative complication.

A sensitive method of assay of antiplasmin activity has been standardized and added to the present range of test systems used for screening of plant extracts and synthetic compounds for biological activity. Of the 275 plants screened for various types of pharmacological activity, 11 were found to be active. Anticancer activity was detected in 9 plants.

About 500 new compounds were synthesized. Primary screening showed pharmacological activity in 31 compounds, anti-implantation in 2, amoebicidal in 17, antibacterial/antifungal in 42, antiviral in 6, antifilarial in 2 and cestodicidal in 2.

The structures of some pharmacologically active compounds isolated from *Tithonia tagetiflora*, *Cocculus laurifolius*, *Vittadinia australis*, and *Ancistrocladus heyneanus* have been elucidated. A diterpenoid from *Coleus barbatus* was found to have hypotensive activity; a terpene from *Roylea cinerea* was active against leukaemia in mice; the diuretic principle of *Vittadinia australis* showed 80% of the activity of chlorthiazide; and spasmolytic activities of allohimachalol monoester from *Cedrus deodara* and of cedricladine from *Ancistrocladus heyneanus* were better than that of papaverine. Total ethyl acetate extract of *Commiphora mukul* (guggal) showed up to 35% hypocholesterolemic activity in cholesterol-fed rabbits.

A nitrosalicylaldehyde isothiocyanate has been synthesized; the drug shows good cestodicidal activity at a single dose of 30 mg/kg in tapeworm infection in rat.

A cyclic tetrapeptide, L-alanyl-L-lysyl-L-alanyl-L-glutamyl, was synthesized and found to be cent per cent effective in preventing implantation in rat when instilled into the uterus on third day of pregnancy. On day 10 the implantations appeared necrosed and in process of resorption, which was completed by day 18.

Studies on axenic cultivation of *Entamoeba histolytica* have shown that the lower the negative oxidation-reduction (O-R) potential of the medium, the shorter is the lag phase, and the maximum population of amoeba obtained is also higher. In a medium containing cysteine, but no ascorbic acid, the negative O-R potential was suitable for profuse growth of amoeba. Based on the above findings, a reliable method for testing direct-acting amoebicides against axenic *E. histolytica* has been developed.

The process of encystation of the free-living amoeba *Hartmannella culbertsoni*, triggered by biogenic amines, was found to be associated with greater degradation of glycogen and channelling of the glucose to the build-up of cellulose and mucopolysaccharides than in the controls, indicating the possible activation of glycogen phosphorylase during encystment. Axenised cultures of *H. rhysodes* were found to encyst when exposed to the triggering action of taurine or epinephrine, but *H. castellani* could not be encysted under the same conditions.

Studies on storage of spermatozoa in epididymis of rat have indicated that androgen is essential for survival and motility of sperms and that the cauda region appears to be the most favourable site for their survival. The results also suggest that the epididymis is not autonomous in androgen synthesis and its contribution to the steroid pool may not be of any physiological significance. It is also likely that an epididymal progesterone is not an obligatory intermediate in testosterone synthesis.

Continuous daily administration of a low dose (in common salt) of the antifilarial drug diethylcarbamazine citrate was found to disturb the normal periodicity of microfilaria in human filarial infection due to *Wuchereria bancrofti*. The microfilariae from treated persons developed normally in the vector mosquito.

The antiviral action of 6-MFA, a substance obtained from *Aspergillus flavus*, was found to be due to induction of interferon in the host animal.

Immunological studies in experimental cholera using *Vibrio cholerae* strains belonging to different serotypes (serotypes 1 and 6) showed that antibacterial immunity was strictly serotype specific, with evidence of cross protection only between Ogawa and Inaba subtypes of serotype 1.

One hundred and thirty-four research papers and review articles were published and five patents were filed during the year.

PATENTS ACCEPTED

Indian Pat. 131175

A method for commercial production of glycyrrhetinic acid from liquorice roots

C. K. Atal, K. L. Dhar & O. P. Gupta
Regional Research Laboratory, Jammu

In the patent under reference all the conditions which are highly specific have been worked out : *p*H and temperature required for aqueous extraction and precipitation of crude glycyrrhizic acid, and concentration of sulphuric acid required, along with the temperature and time for the completion of hydrolysis. Converting the gummy mass of the acid into crystallin product in one step is a novelty of the process.

The process involves the extraction of liquorice roots with hot water at about *p*H 8. On concentration of the extract and addition of sulphuric acid, crude glycyrrhizic acid gets precipitated. The dried precipitate is directly hydrolyzed with 2-3% sulphuric acid in an autoclave at about 140°C. The crude glycyrrhetinic acid is extracted with chloroform from the hydrolyzed product. On concentration and crystallization from ethyl acetate, the acid is directly obtained. The conventional method involves purification of glycyrrhizic acid before subjecting it to hydrolysis and final crystallization from different solvents ranging from acetone to petroleum ether and their mixtures. Purification of glycyrrhizic acid is generally done by making either ammonium or potassium salt. The present method eliminates all such tedious processes.

The acid and its derivatives are good anti-inflammatory agents. In this respect the acid compares well with cortisone, presumably due to close similarities in chemical structure. In some European countries, the acid and its derivatives are being used in the treatment of skin diseases, peptic ulcer, rheumatoid arthritis and obesity. A number of derivatives of the acid have been reported to have high therapeutic values. Mention may be made of hemisuccinic ester of the glycyrrhetinic acid and its disodium salt. The latter, which is known in commerce as carbenoxolone sodium, is a water-soluble compound and possesses more antiulcer and antiinflammatory activity. Carbenoxolone sodium is available in Europe in a special gelatin capsule as a proprietary preparation under the name Duogastrone.

PATENTS FILED

145528 : Japan (corresponding to Indian Pat. 747/72) : Improvements in or relating to the production of composite nickel powder for sintered matrices used in alkaline batteries, H. V. K. Udupa, P. V. Vasudeva Rao & Prema Rangorath—CECRI, Karaikudi.

68/Cal/75 : Improvements in or relating to utilization of ferric chloride as a reagent for the extraction of non-ferrous metals like lead, zinc, nickel, cobalt and the like from their sulphide ores, R. K. Paramguru & P. K. Jena—RRL, Bhubaneswar.

115/Cal/75 : Improvements in or relating to anodizing aluminium and its alloys using alternating current in sulphuric acid electrolyte, B. A. Shenoi, V. Balasubramanian & S. John—CECRI, Karaikudi.

302/Cal/75 : Improvements in or relating to the manufacture of $1\ \mu$ size aluminium oxide of electronic grade from aluminium foil, G. Prasad—RRL, Jorhat.

303/Cal/75 : Improvements in or relating to the production of blue ultramarine, S. B. Chaudhuri & B. K. Saikia—RRL, Jorhat.

305/Cal/75 : Improvements in or relating to corrosion monitoring probes, K. S. Rajagopalan & N. S. Rengaswamy—CECRI, Karaikudi.

2833/Cal/74 : A process for the synthesis of 2, 4, 5-trisubstituted pyrimidines, H. Junjappa, S. M. S. Chauhan, R. R. Rastogi & C. M. Dwivedi—CDRI, Lucknow.

2834/Cal/74 : Modifications and or improvements in or relating to a hydraulic prop, R. Gupta & B. Singh—CMRS, Dhanbad.

2861/Cal/74 : Improvements in or relating to rotary positive displacement pump, J. S. Murty & A. K. Jouhari—RRL, Bhubaneswar.

31/Cal/75 : A process for the synthesis of *cis-* and *trans*-4-amino-2, 3, 4, 5-tetrahydro-1-benzoxepin-5-ols, V. K. Tandon, J. M. Khanna, N. Anand & P. R. Dua—CDRI, Lucknow.

Administrative Management Course at CSIO

The fourth course on Administrative Management under the CSIR Management Training Programme was conducted from 21 to 31 July 1975 at the Central Scientific Instruments Organisation (CSIO), Chandigarh. In all, thirty-six trainees participated in the course. The participants included Section Officers, Administrative Officers and Scientists of CSIR laboratories of the northern region and of CSIR Headquarters besides four administrative personnel, one each from the Indian Agricultural Research Institute, New Delhi; the Tata Institute of Fundamental Research, Bombay; the Virus Research Institute, Poona; and the Birbal Sahni Institute of Paeleobotany, Lucknow.

Inaugurating the course, Shri G. V. Gupta, Home Secretary of the Union Territory of Chandigarh, emphasized the need for attuning the personnel engaged in R & D organizations towards achieving optimum results.

The faculty included two directors of CSIR laboratories, Chief (Planning), and members of the core faculty of the CSIR's Management Training Unit. In addition, experts from management development institutions in the country shared their experiences during the 40-session programme.

The course contents were so designed as to achieve attitudinal change, role clarity and skill formation, and to arouse awareness among the participants in modern management techniques, concepts and principles and apply them creatively in various functional areas and develop internal expertise on management training.

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, while delivering the valedictory address, implored the participants to be innovative in their respective field of work in administration. He assured full support for system development and said that no organization would stand in the way of introducing and implementing a better administrative system embodying modern principles of management. The course had opened up vistas for better administration in national laboratories by preparing the administrative personnel in their mental make-up to accept the change, he added.

Dr Rao (NAL) Gets Roy Fedden Prize

Dr K. V. L. Rao of the National Aeronautical Laboratory (NAL), Bangalore, has been awarded the 1974 Roy Fedden Prize of the School of Mechanical Engineering, Cranfield Institute of Technology, UK, at the annual convocation of the Institute held on 9 May 1975. The award, presented annually to the author of the best thesis in the School of Mechanical Engineering of the Institute, carried a citation and a cash prize of Rs 1000. Dr Rao was a Commonwealth research scholar at the Institute during 1971-74, and the topic of his thesis was "Spark ignition studies in flowing fuel-air mixtures".

New Chairmen of Coordination Councils

With effect from 10 August 1975 new chairmen for four of the coordination councils of CSIR laboratories and cooperative industrial research associations have been appointed for a period of two years:

	Coordination Council for	*Chairman*
1.	Chemical Sciences Group	Dr G. S. Sidhu Director Regional Research Laboratory Hyderabad
2.	Physical and Earth Sciences Group	Dr Amarjit Singh Director Central Electronics Engineering Research Institute, Pilani
3.	Fibre Science Group	Dr P. C. Mehta Director Ahmedabad Textile Industry's Research Association Ahmedabad
4.	Information Sciences Group	Shri S. Parthasarathy Scientist-in-charge Indian National Scientific Documentation Centre, New Delhi

Obituary

Dr G. J. Mohanrao

We record with deep regret the passing away of Dr G. J. Mohanrao, Scientist F, National Environmental Engineering Research Institute, Nagpur, on 3 August 1975 while he was in Tehran on a WHO assignment.

Born on 3 August 1930, Dr Mohanrao obtained his B.Sc. (Hons) and M.Sc. degrees in chemical technology from the Andhra University in 1950 and 1951 respectively. His research work at the Indian Institute of Science, Bangalore, earned him Ph.D. degree in sanitary chemistry from the University of Bombay in 1954.

During 1954-56, he worked with the Delhi Joint Water and Sewage Board, looking after the operation and assessment of performance of the sewage treatment plants at Okhla, Delhi. In 1956, he joined the Massachusetts Institute of Technology as a Fullbright scholar, from where he obtained M.S. and Sc.D. degrees in sanitary engineering. After his studies at MIT, he had taken an assignment at the California Institute of Technology in 1959. Until 1962, he worked at Caltech and the University of California in San Diego on the occurrence and behaviour of radioactive isotopes in sewage and sewage treatment plants.

Dr Mohanrao joined NEERI as Assistant Director in October 1962. He was promoted as Scientist F in December 1972. He was Scientist-in-charge of the institute from September 1971 to March 1973.

A specialist in the fields of water pollution control and treatment of industrial wastes, he has developed economic and indigenous systems for the treatment of wastes from several industries.

Dr Mohanrao worked as a consultant to the Scripps Institute of Oceanography of the University of California at La Jolla, California. He served as a member of expert committees appointed by WHO on two occasions. He also served as a short-term consultant to WHO on several occasions.

Dr Mohanrao was a member of several learned societies in India and abroad in the field of environmental science and engineering. He made significant contributions in the field of waste treatment. His advice was frequently sought by national and international bodies on matters concerning water pollution.

Dr G. K. Seth

We record with deep regret another sad event from the National Environmental Engineering Research Institute (NEERI), Nagpur—the demise of Dr G. K. Seth, Scientist E; Dr Seth died of a heart attack on 18 August 1975.

Born on 7 August 1923 at Jullundur, Dr Seth obtained M.Sc. (Hons) in chemistry from the University of Punjab (Lahore) in 1946 and D.Phil. in applied chemistry from the Calcutta University in 1955. During 1953-54, he pursued advanced studies in USA in the field of environmental health. He served the All India Institute of Hygiene and Public Health, Calcutta, as Research Chemist during 1947-49 and the Indian Council of Medical Research as Research Officer during 1950-59. Joining NEERI as Senior Scientific Officer in 1959, when the laboratory was in its formative period, he successfully accomplished the task of establishing the zonal laboratory of the institute at Hyderabad. In May 1966, he was promoted as Scientist E, and in January 1970 he was transferred to the Headquarters at Nagpur where he took charge of planning, monitoring and evaluation of projects, and training, information, liasion and extension work. Here, he did an excellent job which earned him reputation as information specialist in the field of environmental engineering.

During 1972, he visited several R & D institutions in UK, the Netherlands and Switzerland on a WHO fellowship, and established links with various international organizations.

Dr Seth has nearly 50 research papers and popular articles to his credit.

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CSIR NEWS
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CSIR Linkages with States for Technology Utilization

In an effort to build linkages at state level, the Director General, Scientific & Industrial Research, had proposed that a systematic study of the states' fifth plans and the programmes of the states and industry be made by CSIR laboratories located in the states. The aim of the study was to identify the major areas of thrust in industrial, economic and social development and the major scientific and technological gaps. Such a study was also to involve discussions with state officials, representatives of industrial associations and academic and research institutions. Based on these studies, areas where CSIR could interact and provide assistance to the development of the states could be indicated.

CSIR has also laid down guidelines for setting up regional centres, extension units, polytechnology clinics, etc. in those areas where needs are clearly indicated. These include financial and technical participation of state governments and industries and CSIR, the normal pattern being 50% share of expenditure, both recurring and capital. The Polytechnology Clinic, which will act as a diagnostic and direction centre to get at solutions of industry's problems, will be an important vehicle for CSIR's interaction with industry in states.

During their visits to state capitals and discussions the DGSIR and Chief (Technology Utilization) had with state officials, university authorities and industrial representatives, considerable interest was shown in the setting up of such centres. These will take into account the existing capabilities and the special needs of various areas and their relation to the state and central plans.

A gist of these discussions and progress of efforts in this direction is given below :

Andaman & Nicobar Islands

The resources and plans of the Islands have been studied. After discussions which the DGSIR had with the Union Home Minister, it was proposed to lead a team for discussion at the Islands.

Andhra Pradesh

At the get-together of CSIR scientists, state officials and industries of the state, held in Hyderabad on 4 August 1974, it was decided that a Polytechnology Clinic be set up in Hyderabad. The state government agreed to contribute 50% share of expenditure for a period of two years in the first instance. The proposal is under implementation.

The potential of science has already been harnessed for all-round development in some parts of the world with encouraging results. The extent of interaction between science and development has yet to be fully explored in India under the existing conditions. A good point to start this interaction may be all-round developments at the district level. Science may be made to permeate in the various fields in an integrated manner. For achieving this objective, CSIR has to join hands with the other scientific agencies such as the Indian Council of Agricultural Research and the Indian Council of Medical Research.

Discussions have been and are being held by CSIR with some of the state governments for selecting some districts for adoption and development through science. CSIR in cooperation and consultation with the state governments and other scientific organizations in the country will make an attempt to develop some of the underdeveloped districts through the application of modern science and technology in a given time-frame. The essence of this experiment is to bring science and technology to the doors of the people who need it; to use the local materials and men and to provide gainful employment; to involve the people of the district to help themselves and to harness science and technology to accelerate the development process; and to integrate science and society.

At the instance of the Government of Andhra Pradesh, Karimnagar in Andhra Pradesh has been adopted for the purpose. Each of the CSIR laboratories and the laboratories of other research agencies participates and contributes in this venture — a venture which has an element of novelty. Because of the novelty of the experiment the process of groping had to be gone through to some extent initially but it is for scientists to strive to reach the goal surely and expeditiously.

The object, naturally, is not to start the work of planning and development *ab initio* but to integrate with and complement, to the extent possible, the plans and schemes that may be already on the anvil in the state. Care is also taken to ensure active participation and full utilization of local talent and resources. The actual implementation of the various development schemes is entrusted to the state and other agencies, whereas the scientific organizations with their expertise are fully involved in bringing out the scientifically drawn project proposals in consultation with the concerned state organizations and will continue their association throughout the implementation stage.

Detailed sectoral plans have been prepared and are under implementation.

Assam & Union Territories in the Region

The Regional Research Laboratory (RRL), Jorhat, has an important role to contribute to the development of the north-eastern states of Assam, Arunachal Pradesh, Nagaland, Meghalaya, Manipur, Tripura and Mizoram. RRL, Jorhat, has plans to set up sub-stations at Nagaland, Tripura, Arunachal Pradesh, Meghalaya and Manipur.

Bihar

A get-together between CSIR scientists, industries and officials of Bihar Government was organized recently. As a result of the discussions held between the scientists of CSIR and officials of Bihar, a number of projects have been identified. The Government of Bihar is also interested in a CSIR Polytechnology Clinic.

Gujarat

The Director of the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, with the cooperation and association of the officials of the Department of Industries completed a study on areas of R & D in the fifth plan of Gujarat in December 1974. The report was discussed at a get-together organized by CSMCRI in Ahmedabad recently.

The Government and industry were keen to set up a CSIR Polytechnology Clinic and also to participate in CSIR activities in the state. They are also interested in a medicinal plants unit, a MERADO centre for textile machinery and tool design, and a CSIO centre for precision engineering and wrist watches.

Jammu & Kashmir

The Regional Research Laboratory (RRL), Jammu, undertook a survey of industries in Jammu & Kashmir and presented a report at the Research and Industry Get-together held at Srinagar in October 1974.

In order to achieve intensive interaction between scientists and technologists on the one hand and the industrialists on the other, the conference was divided into six groups : (i) agriculture and horticulture; (ii) engineering (including pharmaceuticals); (iii) forest-based industries; (iv) food industries (including mushrooms); (v) mineral-based industries; and (vi) leather, paper machine and other handicrafts.

Follow-up action is being taken by RRL, Jammu.

Karnataka

The Central Food Technological Research Institute (CFTRI), Mysore, with the cooperation and collaboration of the National Aeronautical Laboratory and the Indian Plywood Industries Research Institute, carried out a survey of agro-based, engineering, electronic, forest and other non-engineering based industries in the state in 1974. The report covered : (i) Karnataka State's programmes; (ii) Problems and suggestions arising out of the discussion with industrial organizations; and (iii) State's development programmes and nature of assistance required by the industries.

Based on this study, CSIR and its laboratories are interacting with the industries of the state in providing necessary assistance in scientific and technological areas. A get-together was held in June 1975, and it was decided to set up a Polytechnology Clinic in Bangalore.

Kerala

As a result of discussions held between CSIR scientists, industries and the officials of the state government, it was decided that CSIR would set up certain research & development centres in Kerala. CSIR, therefore, put up a number of project proposals to the Government of Kerala, indicating the type of activities proposed to be undertaken at Trivandrum and Cochin. These included taking over of the Industrial Research & Testing Laboratory at Trivandrum and setting up of centres of CFTRI and CGCRI and a Polytechnology Clinic at Trivandrum, and MERADO centre, NEERI unit and CSIO unit at Cochin. The Structural Engineering Research Centre and the Central Electrochemical Research Institute have also prepared proposals to set up centres in Kerala.

The Governing Body approved the setting up of CSIR centres with the financial participation of the Government of Kerala.

Madhya Pradesh

Negotiations between CSIR and the Government of Madhya Pradesh have taken place, and a request for setting up a regional research laboratory has been considered. The Sidhu Committee is not in favour of setting up laboratories of a general type. The specific nature of CSIR activities was the subject of a meeting held by the Director General, Scientific & Industrial Research with the Chief Minister of Madhya Pradesh in August 1973.

Maharashtra

The Central Glass & Ceramic Research Institute is setting up a regional centre in Maharashtra.

At the instance of the Maharashtra Government and the active participation of the National Chemical Laboratory (NCL), Poona, Chandrapur District has been considered for adoption in Maharashtra for intensive and integrated development through science and technology. The National Environmental Engineering Research Institute (NEERI), Nagpur, situated at a distance of about 100 miles from Chandrapur, would play a considerable role in this project.

The scientists of NCL have prepared a draft project for formulating a development plan for Chandrapur. NCL i following up the project.

Punjab & Haryana

In February 1974, Chief (Technology Utilization) had discussions with the officials of the Department of Industries (Punjab) when an urgent need for an agro-engineering R & D centre was expressed. CSIR guidelines have been sent to them and their reaction is awaited.

The requirements of Punjab have been studied by Dr G. S. Sidhu, who has recommended the following :

(i) A Polytechnology Clinic at Chandigarh to cater to Punjab, Haryana and Chandigarh,
(ii) Locating the four existing extension centres in the campus at Ludhiana,
(iii) A NEERI centre at Ludhiana, and
(iv) Facilities for physico-chemical analysis at Ludhiana.

CSIR guidelines have also been forwarded to Haryana for enabling the state government to identify the type of CSIR assistance desired.

Rajasthan

Sometime in July 1972, Chief (Technology Utilization) visited Bharatpur District at the instance of Shri G. P. Tewari, MLA. As a result, the Directors of RRL, Hyderabad, RRL, Jorhat, CIMPO and CGCRI were requested to study R & D potential in this area.

At a meeting of DGSIR with the Chief Minister in August 1972, it was suggested that CSIR should set up some R & D units in Rajasthan which could cater to the needs of the state's industries.

The state government suggested the setting up of : (i) a testing and design development centre at Jaipur; and (ii) a laboratory for mineral and ore dressing at Udaipur.

The Indian Bureau of Mines is already setting up a mineral and ore dressing laboratory and pilot plant at Ajmer.

The Director, Central Electronics Engineering Research Institute (CEERI), Pilani, took up the dialogue with the state government regarding their participation and priority activities desired by the state.

The type of CSIR assistance will be decided according to the need indicated by the Government of Rajasthan and their fiscal participation.

Uttar Pradesh

A meeting took place in Lucknow on 11 September 1973 between the DGSIR, scientists of CSIR, industries and officials of state government. Certain decisions aimed at interaction between CSIR and the state government were taken.

To decide which backward district CSIR should adopt in Uttar Pradesh, a team consisting of CSIR scientists and the officials of the Planning Department of the state government visited the districts of Unnao and Sitapur in November 1974. There were two more districts, viz. Etawah and Fatehpur, to be visited by the team before a final decision could be made. These districts were suggested by the state government.

The Director of the Central Drug Research Institute in consultation with the Chief Minister has suggested the adoption of Unnao by CSIR.

West Bengal

The Planning Board of West Bengal approached CSIR for the setting up of a CSIR multidisciplinary complex in Calcutta. The state government was informed that the Central Mechanical Engineering Research Institute (CMERI), Durgapur, had undertaken certain exercises aimed at defining the areas and problems of industry in the state where CSIR could interact. The initiation of a new activity would thus emerge out of this exercise. CMERI has been requested to follow up this matter with the state government.

The Directorate of Industries has been provided with the guidelines for setting up of a Polytechnology Clinic in West Bengal.

Dr Krishnan (NAL) Gets Vikram Sarabhai Award

Dr S. Krishnan, Head, Electronics Division of the National Aeronautical Laboratory (NAL), Bangalore, has been conferred the Vikram Sarabhai Research Award for his significant contributions in the field of electronics and telecommunication.

Born in 1934 in Mahadanapuram near Cape Comorin, Dr Krishnan had his schooling in Kerala and obtained B.Sc. (Hons) degree in 1955, securing first rank, from the Kerala University. He joined the Indian Institute of Science in 1955 and worked on the design and realization of a special-purpose analogue computer for double fourier summation, and obtained the Ph.D. degree of the Kerala University. For a short period he was at the Ahmedabad Textile Industry's Research Association, Ahmedabad.

Dr Krishnan joined NAL as a Senior Scientific Officer in 1960 and was later promoted as Assistant Director (Scientist E). At NAL, he was responsible for organizing the Electronics Division and for starting several projects of relevance to the laboratory. He has made a substantial contribution to the designing of the 4 × 4 ft trisonic wind tunnel and several electronics systems required for the wind tunnels, in particular the data logging systems. He has been largely responsible for setting up a nucleus to build the capability in this important area of data handling in the division. As a consequence, data logging systems could be designed and built and the interest shown in this scheme by many outside laboratories resulted in the establishment of a pilot plant for fabrication and supply of such systems on a semi-commercial scale. This pilot unit has designed and supplied several data systems and components to various industries in the country and has made systems worth Rs 2·60 million so far.

Dr Krishnan

Dr Krishnan also started a group in the division to work in power electronics. Using electronic devices and circuits developed in the laboratory and elsewhere, high-performance power systems have been developed. Work on power electronics also resulted in the realization of speed and temperature control systems for the industry. Several sponsored projects were undertaken for the industry and as a result the division supplied to industry a large number of impulse magnetizers, protective networks for rectifier systems, speed and temperature controllers and calibration equipment.

Dr Krishnan has about 25 research papers to his credit. He was co-recipient of the NRDC's award for spark machining. He was elected a Fellow of the Indian Academy of Sciences in 1974. He served as Visiting Professor in the School of Automation, Indian Institute of Science, and at the Raman Research Institute at different times. He is a member of the Instruments Research Committee of CSIR.

Dr Krishnan was appointed on promotion Scientist F at NAL on 9 June 1975.

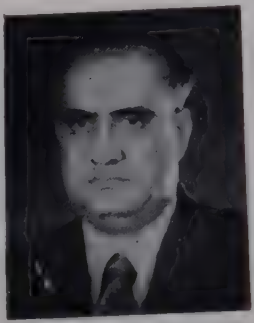
Dr Doraiswamy & Dr Bhide Rewarded for Outstanding Work

Dr L. K. Doraiswamy, Scientist F, of the National Chemical Laboratory, Poona, and Dr V. G. Bhide, Scientist F, of the National Physical Laboratory, New Delhi, have been rewarded with a scale of pay equivalent to that of the Director of a CSIR laboratory. It may be recalled that CSIR instituted last year a special merit promotion scheme for senior scientists with a view to preventing diversion of outstanding research talent to non-research assignments.

Brief accounts of the scientific attainments of the two scientists, who have been thus rewarded with effect from 26 July 1975, are given below :

Dr L. K. Doraiswamy

Dr Doraiswamy's research work has been mainly concerned with chemical reaction engineering and chemical engineering thermodynamics. The development of catalysts, estimation of their engineering properties, modelling of chemical reactions and the ultimate design of a catalytic reactor are of prime importance not only from the basic engineering point of view but also in the development of industrial reactors. The ability to predict important thermodynamic properties is a basic requirement in process design. Dr Doraiswamy has contributed significantly to the development of both these areas of chemical engineering.



Dr Doraiswamy

In the course of studies in chemical reaction engineering, Dr Doraiswamy along with his students has developed a new reactor system for carrying out exothermic reactions. This is the so-called mixed-tubular semi-fluidized bed reactor in which a fully mixed zone is followed by a plug-flow zone. The combination of these two modes of fluid flow results in optimal reactor performance for certain classes of reactions. He has also systematized the procedures for discerning the regime in which a reactor would operate. The reactor design procedure to be used depends on the regime of operation. Several industrially important reactions have been analyzed in depth and rate models proposed, which take into account the phenomena occurring on the catalyst surface.

A particularly important contribution is the design of a reactor for obtaining precise kinetic data. Disguised kinetics has been studied in detail and methods have been proposed for extracting the intrinsic kinetic parameters from a set of experimental data or to obtain the undisguised values directly by experimentation.

Dr Doraiswamy's studies have also included a detailed analysis of the behaviour of a catalyst pellet in a reactive environment. He and his associates have developed a procedure for accounting for the role of diffusion and adsorption of reactant within the solid matrix, which can be used for predicting the macro-kinetic behaviour of the pellet and thus for designing a catalytic reactor. His theoretical researches have also elucidated the phenomenon of reactor sensitivity to inlet conditions.

A major continuing area of his interest is the concept of catalyst effectiveness and its extension to a variety of systems such as gas-liquid and solid-solid. Dr Doraiswamy has also done extensive work in the modelling of gas-solid and gas-liquid reactions.

In the field of chemical engineering thermodynamics he has been responsible for developing estimation procedures for important thermodynamic properties which are now being widely used practically in all chemical and process development laboratories. For instance, the methods proposed by him and his colleagues for the estimation of heats of formation of organic compounds, heat capacities of organic compounds and latent heats of vaporization are now regarded as standard procedures.

Dr Doraiswamy has been actively associated with the process development programmes at NCL. Several processes of great industrial value developed under his direction have been transferred to industry and are now in successful operation. A procedure is now being worked out at NCL by which all major processes emanating from the laboratory will be offered at well-defined levels of transfer.

In addition to process development and design, his present work at NCL is concerned with the development of generalized concepts in chemical reaction engineering and systematized methods of process development with particular reference to continuous reactions and reactions involving fluidized beds.

Dr Doraiswamy has received wide recognition for his researches, practically all of which were carried out at NCL. Dr Doraiswamy joined NCL after receiving his Ph.D. from the University of Wisconsin under Prof O. H. Hougen. He has lectured widely at the invitation of chemical engineering departments in India and abroad He is a member of the Indian Institute of Chemical Engineers, the Indian Academy of Sciences and the governing council of the Society for Heat and Mass Transfer. He is on the senate of the Indian Institute of Technology, Bombay, and is the convener of the Chemical Engineering Research Committee of CSIR. He is a recipient of the K. G. Naik gold medal of the University of Baroda. He has served on the boards of Engineers India Ltd and Indian Drugs & Pharmaceuticals Ltd. As a consultant to the Indian Petrochemicals Corporation Ltd, he was associated in the planning of their R & D centre. He was also associated with the NCST Panels on Bulk Organic Chemicals and Chemical Engineering Design.

Dr Doraiswamy is a member of the editorial advisory board of Catalysis Reviews : Science and Engineering. He is also a reviewer for several chemical engineering journals published from many countries. He is a recognized Ph.D. guide of many Indian universities.

Dr V. G. Bhide

Dr Bhide

Dr Bhide has worked in various branches of solid state physics, namely crystal growth, ferroelectricity, ferromagnetism, Mössbaur and X-ray spectroscopy, liquid crystals and materials science. Soon after the discovery of Mössbauer effect for which Prof. Mössbauer was awarded the Nobel Prize in 1961, Dr Bhide and his group designed and fabricated indigenously a Mössbauer spectrometer. His group has contributed substantially and has opened new avenues in this field which are being pursued all over the world. His book on Mössbauer effect and its applications has served as a text for a beginner and as a source book for researchers in this field.

Dr Bhide has to his credit 85 original publications and monographs and has directed 25 students for the Ph.D. degree of various universities in India. He also holds a number of patents which are being exploited. Dr Bhide is a Fellow of the Royal Astronomical Society, Indian Academy of Sciences, and Indian National Science Academy (INSA), and was secretary of INSA during 1971-75. He is a member of the International Consultative Committee on the Applications of Mössbauer Effect. He is a member of several committees including those of CSIR, National Committee on Science and Technology, and Electronics Commission. He is also a member of the National Committee on Pure and Applied Physics. Dr Bhide was the President of the Physics Section of the Indian Science Congress held at Bangalore in 1971. He has been honoured by the Marathi Vigyan Parishad for his contributions to science and technology.

Dr Bhide has compiled status reports on cryogenics and solar energy which have become the basis of developments in these two important fields. Dr Bhide is editor of Indian Journal of Physics Education and is on the editorial board of several research journals in physics. He was the convener of the study group appointed by the National Council of Educational Research and Training, which has developed an experimental approach to the teaching of physics at the school level.

Born on 8 August 1925, Dr Bhide received his university education at the Nagpur University, where he got his masters and doctorate in physics. His Ph.D. work was concerned with gaseous electronics. Proceeding to UK as a Government of India scholar, he worked in the University of London under the guidance of Prof. S. Tolansky, F.R.S. His Ph.D. thesis on optical and interferometric studies of some aspects of crystal growth submitted to the London University was published in the microfilm form by Micro Methods Ltd, London.

Dr Bhide started his career as a lecturer in physics at the College of Science, Nagpur, where he subsequently became Professor and Head of the Physics Department. He was later Professor and Head of the Physics Department at the Institute of Science, Bombay. He joined the National Physical Laboratory as Deputy Director (Scientist F) in 1966 and assumed charge of the Basic Physics Division.

At NPL, Dr Bhide has built a very active group in Mössbauer and X-ray spectroscopy, cryogenics, liquid crystals and materials characterization.

Dr Bhide has lectured at various universities and research institutions in UK, France, USA, USSR, Australia, Japan, and other countries.

Deputation Briefs

Smt Kamala Ramachandran of the Publications & Information Directorate (PID), New Delhi, completed a 6-week study tour of UK under the CSIR-British Council Exchange Programme from 15 June to 25 July 1975. Attached to the Royal Botanic Gardens at Kew and Edinburgh, she worked on the taxonomy of Indian economic plants and updated the plant list for revising The Wealth of India—an encyclopaedia of Indian raw materials of plant, animal and mineral origin, being published by PID. Smt Ramachandran also visited the Tropical Products Institute, London, and the Commonwealth Bureau of Agricultural Economics and Rural Sociology and the Forestry Institute at Oxford.

Training Camp in Mango-Processing : BITM

The Birla Industrial & Technological Museum, Calcutta, in collaboration with the Central Food Technological Research Institute, Mysore, and the Cottage & Small Scale Industries of the Government of West Bengal organized a mango-processing camp at Malda (West Bengal) from 18 to 25 July 1975. Eighteen trainees were given theoretical and practical training in the preparation of mango products like squash, jam, *chatni* (sauce), and mango slice in syrup. These products have considerable export potential.

The training also provided technical guidance and know-how of various mango processes to the local people and entrepreneurs to enable them to start cottage and small scale industries for the economic development of the district.

Unesco Workshop for Information Users

A Unesco workshop for training users of scientific and technical information was held at the National Science Library under the auspices of the Indian National Scientific Documentation Centre (Insdoc), New Delhi, during 25-27 August 1975. Two experts, Prof. A. J. Evans and Mrs E. A. Wilkinson, both of Loughborough University of Technology (UK), were in charge of the programme, which was attended by 30 scientists from the Department of Science and Technology, CSIR laboratories in the northern region, Indian Institute of Technology, Delhi, and the Delhi University.

The purpose of the workshop was to acquaint the participants with the various sources of published information and to show them how to get any information quickly. Prof. Evans achieved this goal by means of lectures, tape-slide programmes and practical demonstrations. On the concluding day Mrs Wilkinson explained computer-searching of engineering information with the Loughborough University Library's 'Compendex' system. The users were introduced to current awareness services, maintenance of personal files and selective dissemination of information. Throughout the course, the emphasis was on the methodology of approach to information.

CSIR Support To Research

New Schemes

Breakdown Agents for Sodium Silicate-Carbon Dioxide Bonded Sands

Methods to improve the breakdown characteristics of carbon dioxide bonded sands is a welcome feature to the foundry technology as they have a direct bearing on the cost of production. Sodium silicate-carbon dioxide method, though widely employed in the metal casting industry for the production of cores and moulds where dimensional accuracy needs particular attention, causes difficulties during the knock-out operations due to the high strength values of carbon dioxide- bonded sands at room temperature after being subjected to high temperature during the solidification of metals. Under a new CSIR scheme granted to them, Dr V. Panchanathan (principal investigator) and Dr H. Md Roshan (co-investigator), Department of Metallurgy, Indian Institute of Technology, Madras, propose to study the influence of various inorganic and organic additives on the breakdown properties of CO_2-bonded sands. Inorganic additives such as bentonites and fireclay and organic additives such as molasses, dextrine starch, coal dust, pitch, wood flour and fuel oil would be tried. It is also proposed to develop sand mixtures used in CO_2 process which have excellent breakdown properties and thus cause lesser problems during knockout of moulds cast with ferrous and non-ferrous metals and alloys. Breakdown properties of these sands would be evaluated by suitable methods.

Completed Schemes

Hormonal Control of Gonads and Accessory Reproductive Organs in Frogs and Toads

Spawning in amphibia is a consummate process involving liberation of eggs, their transport to the ostium through the peritoneal cavity, their passage through the oviduct, secretion of oviductal jelly and physiological maturation in the oviduct and finally their extrusion (oviposition). Each of these steps is controlled and conducted by hormones. Hormonal control of gonads and accessory reproductive organs in frogs and toads was studied by Miss M. Suvarnalatha (a CSIR research fellow) under the guidance of Dr H. B. Devaraj Sarkar in the Department of Zoology, University of Mysore, Mysore.

By removing alternate oviducts and/or ovaries and inducing them to spawn, the occurrence of two specific ciliary tracts which propel the ovulated eggs to the ostium was demonstrated. The ovulation inducing potency of the pituitary of three species of frogs and one species of toad as also the ovulatory response of the ovaries of these frogs and toads was analyzed by *in vitro* studies. All steroids used induced ovulation, and progesterone was found to be relatively more potent than others. Of the frogs, *Rana hexadactyla* did not respond at all, and skipper frog ovary was found to be more responsive and ovulated even without pre-sensitization. Bilateral ovariectomy did not impair the functional status of the oviducts but brought about a refractoriness on the part of the animal itself. Functional compensatory hypertrophy as exhibited by increased spawning was demonstrated in hemispayed frogs.

Histophysiology of the oviduct was studied in the skipper frog to examine how this seemingly simple tube-like structure is equipped to secrete the jelly, a mucoproteinaceous material, which is essential for the physiological maturation of the eggs. Proteins, carbohydrates and phosphatases were localized by using appropriate histochemical techniques. Two types of cells in epithelial ridge, viz. ciliated cells with acidophilic inclusions—proteins containing -S-S- and SH- groups—and nonciliated cells mostly with mucoproteinaceous material, and jelly gland containing both, were identified. Alkaline phosphatase activity restricted t the margin of the epithelial ridge seem to be involved in jelly secretion.

Occurrence of compensatory hypertrophy of the testis has led to controversial claims. But this has been clearl demonstrated in hemicastrated frog and toads. The effect of different steroids on these hemicastrated frogs wa studied. It was observed that androgens and estrogens blocked compensatory hypertrophy, whereas corticosteroids and progesterone had no significant effect. All the steroids bring about degranulation and vacuolization of the adrenocortical cells. Androgens cause pyncosis of the cortical cells nuclei and 17-ethynylestradiol causes hypertrophy of the stilling cells.

Miss Suvarnalatha has submitted her thesis based on these studies to the Mysore University for the award of Ph.D. degree.

Comprehensive Traffic and Transportation Studies in Bombay Metropolitan Region : CRRI's Project

Unprecedented growth in the population of the Bombay City over the last three decades has heavily strained the availability of all the civic amenities, and transportation facilities have been affected most adversely. Many efforts were made in the past towards formulating road development programmes, foremost among which was the 1962-63 plan by Wilbur Smith & Associates. In this plan was envisaged a set of freeways and express-ways across the Bombay island. The road plan prepared by this foreign firm was confined to the region of Greater Bombay in general and to the Bombay Municipal Corporation area in particular. Hence, it was now realized that the whole of the Bombay Metropolitan Region, which with its area of 4150 km^2 is nearly ten times larger in area than Greater Bombay, should be taken into consideration. Secondly, the plan prepared by Wilbur Smith & Associates was oriented mostly towards the private mode of transport which in today's changed circumstances due to fuel crisis on the one hand and the social goal of giving greater impetus to public mode of transport on the other, needs to be re-assessed in respect of its due role in the circulation pattern of Bombay City.

The Central Road Research Institute (CRRI), New Delhi, has now been assigned the task of conducting an in-depth study of the development of roads in Bombay Metropolitan Region. The road development programme studies as envisaged by CRRI are estimated to cost Rs 40 lakh over a period of four years. The first phase of studies to be carried out in Bombay will be directed towards the planning of traffic management schemes and such other regulatory as well as immediate road improvement programmes by which the optimum utilization of the already available facilities could be achieved. The second and final phase of studies will be in the sphere of planning of new roads to take care of the future needs of the ever- growing traffic in an efficient manner.

This is a major technical consultancy to be handled by CRRI, involving personnel drawn from several subdisciplines.

Insdoc's Documentation & Reprography Training Course : Results

The following candidates have been declared successful in the training course in Documentation and Reprography conducted by the Indian National Scientific Documentation Centre (Insdoc), New Delhi, during 1973-74, and have qualified for the award of Associateship in Documentation and Reprography :

First Division

Shri H. S. D. Khatri (Insdoc, New Delhi); Shri B. K. Prasad (Institute of Mass Communication, New Delhi); Shri K. V. Rangaswamy (Central Electrochemical Research Institute, Karaikudi); Smt K. Subhashini [Small Industry & Extension Training Institute (SIET Institute), Hyderabad]

Second Division

Shri R. L. Anand (Insdoc, New Delhi); Shri S. K. Chadha (Insdoc, New Delhi); Smt J. Indira Subbaram (Bharat Heavy Electricals Ltd, Hyderabad); Shri Rajendra Kumar (Defence Scientific Information & Documentation Centre, Delhi); and Shri H. K. Sampathu (Indian Institute of Science, Bangalore).

PATENTS FILED

71/Cal/75 : Development of a process for manufacturing grinding compound utilizing palm oil sludge, B. C. Mohanty & B. C. Swain—RRL, Bhubaneswar.

304/Cal/75 : Improvement in or relating to fish meal cooker, B. C. Mohanty, A. Parida & T. Gupta—RRL, Bhubaneswar.

170/Cal/75 : Improvements in or relating to the electrolytic reduction of 2,4-dinitrotoluene to 2,4-diaminotoluene, H. V. K. Udupa & P. N. Anantharaman—CECRI, Karaikudi.

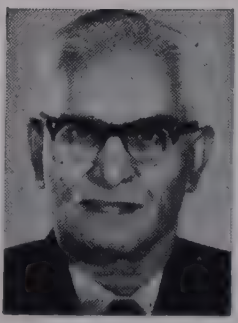
PERSONNEL NEWS

Appointments

Shri C. S. Rangan

Shri C. S. Rangan has been appointed on promotion Scientist F, National Aeronautical Laboratory (NAL), Bangalore, with effect from 9 June 1975.

Born in 1923, Shri Rangan took his B.Sc. degree from the Madras University in 1942 and M.Sc. degree in physics from the Bombay University in 1945. After obtaining a diploma in advanced radio communications he worked as a lecturer in radio physics and electronics in St Xavier's College, Bombay, for five years.



Shri Rangan

In 1950, Shri Rangan joined the National Physical Laboratory, New Delhi, where he worked on microwave measurements. In 1954, he was deputed under the Point-Four Programme to the National Bureau of Standards, Boulder, USA, where he specialized on frequency and time standards. On his return he established the primary standards for the frequency and time transmission centre of call sign A.T.A. at New Delhi, the only one of its kind in South Asia.

Shri Rangan joined NAL as a Senior Scientific Officer in 1961 and was later promoted as Assistant Director (Scientist E). In 1962 he went to UK on a U.N. fellowship and worked at the Royal Aircraft Establishment, Farnborough, for nine months and later visited Hungary under the Scientists Exchange Programme. All these years, he has headed the Instrumentation Division of NAL and has specialized in electronic instrumentation and transducer technology. He has made significant contributions to the design and development of many basic electromechanical sensing devices and associated instrumentation.

He was instrumental in setting up, in 1967, the transducer scheme pilot plant which has gone a long way in establishing the transducer technology in the country. Based on the pilot plant trials, many of the instruments and devices are now being produced by industry.

Shri Rangan is recipient of two NRDC awards. He was Vice President and founder-member of the Instrument Society of India and Vice Chairman of the Society of Environmental Engineers (Indian Chapter). He has 30 publications to his credit.

Honours

Dr R. L. Thakur of the Central Glass & Ceramic Research Institute, Calcutta, has been placed on the international editorial board of the journal 'Ceramurgia International'. The journal, published by the National Research Council of Italy, covers selected studies, recent discoveries and developments in ceramics research and technology. Head of the Solid State Studies Division and of the Scientific Information Services of CGCRI, Dr Thakur is the editor of 'CGCRI Bulletin' from its inception 22 years ago. He is also on the international editorial board of the journal 'Revue internationale des hautes temperatures et des refractories', published from Paris.

* * *

Dr R. K. Ghosh of the Central Road Research Institute, New Delhi, has been invited by the American Concrete Institute (ACI) to act as member of ACI Committee 115-Current Research and ACI Committee 325-Concrete Pavements. Dr Ghosh has also been nominated Guide-Professor on rigid pavements of the World Open University, USA.

Obituary

Dr A. Lahiri

We record with deep regret the demise of Dr A. Lahiri, former Director of the Central Fuel Research Institute (CFRI), Dhanbad : Dr Lahiri died of cardiac failure in London on 26 August 1975. He was taken ill in London while returning to India after his assignment in Chile as UNDP Adviser for a year.

Dr Lahiri

Reputed internationally as a fuel scientist and considered to be an authority on coal, Dr Lahiri was greatly responsible for making CFRI a leading institution in the world for research in fuel science and technology. With a flair for conceptual planning, he put forward a number of schemes for integrated development based on coal and introduced the concept of 'total energy planning' in India. A significant contribution of Dr Lahiri to industrial development is the creation of the Durgapur Complex in West Bengal.

Recipient of many coveted awards from learned institutions, Dr Lahiri also received the Presidential awards Padma Shree and Padma Bhushan.

For several years, he was a Director of the National Coal Development Corporation. He had to his credit about 500 publications and 90 patents.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 10/75

Applications are invited for the post of a Scientist in the scale of Rs 2000-125/2-2500 in the Central Glass & Ceramic Research Institute, Calcutta. The objective of the institute is industry-oriented scientific and applied research in the field of glass, ceramics, refractories, vitreous enamels and mica. Research and development activities of the institute are directed towards : evaluation, beneficiation and utilization of the country's resources of related raw materials; import substitution, development of new technologies and adaptation of imported technologies relevant to the country's social, economic and industrial needs; and improvement of glass and ceramic products and processes, and development of new uses of mica.

Job Requirements : As a senior research management person, he will be expected to formulate research programmes and see to their implementation, will manage, coordinate and evaluate the research programmes and related development and pilot projects relating to the areas mentioned in para 1. He should also help in the transfer of research results from the laboratory to industry and the field.

Qualifications : High academic qualifications in glass technology, ceramic engineering, materials science, physics or chemistry, with adequate experience in R & D and or in industry at a high level.

Salary/Conditions of Service : The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merit. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proforma must be received in this office on or before 22 October 1975.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

* Interim enquiries will not be attended to *

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CSIR's International Technology Transfer Programme

As a sequel to the International Seminar on Technology Transfer held in New Delhi in December 1972, a note of understanding was signed between the Government of India and UNIDO for a programme of cooperation for industrial/technological development among developing countries.

The objective of the programme, known as UNIDO/India Technology Familiarization/Transfer Programme, is to develop and improve the industrial/technological capabilities in India and to make available/exchange, to the extent possible, Indian industrial and technical experience to/with other developing countries. The programme covers the following activities : (i) Exchange missions between India and the developing countries; (ii) Consultation meetings; (iii) Case studies; (iv) Inplant training programme; and (v) Promotional activities.

Exchange Missions

Under this activity, the following countries were invited to send their technical missions to visit India in order to explore opportunities for mutual technological assistance : Afghanistan, Bangladesh, Fiji, Burma, Indonesia, Kenya, Korea, Malaysia, Philippines, Sri Lanka, and Thailand.

Republic of Korea delegation : (*from left*)—Mr S. C. Lee, Mr J. H. Koo, Mr K. Ho. Whang, Dr J. R. Kim, and Mr Duk Jun OH

An inter-ministerial committee of the Government of India supervised this programme and the channel of communication with the developing countries was effected through Indian missions in foreign countries.

Each visiting mission comprised a balanced team of about four individuals, who were technologically competent, were aware of the industrial/technological needs of their country, and occupied responsible positions in industrial concerns, or research and development organizations or government departments concerned with planning and technology transfer.

Republic of Korea : A mission of the following members from South Korea visited India during 6-15 May 1974 : Dr J. R. Kim, Chief, Electrical & Electronics Department, Korea Institute of Science & Technology (leader of delegation); Mr K. Ho. Whang, Head, Management Division, Ministry of Science & Technology; Mr S. C. Lee, Manager, Technical Cooperation Department, Gold Star Electric Co. Ltd; Mr Duk Jun OH, Chairman, Daedong Industrial Co. Ltd; and Mr J. H. Koo, President, Gold Star Electric Co. Ltd.

The places of visit and discussions included : Telecommunication Research Centre, New Delhi; Electronics Corporation of India Ltd, Hyderabad; Indian Telephone Industries Ltd; Bharat Electronics Ltd and New Government Electric Factory, Bangalore; Tata Institute of Fundamental Research and Bhabha Atomic Research Centre, Bombay; Regional Research Laboratory (RRL), Hyderabad; Physical Research Laboratory, Ahmedabad; Punjab Tractors and Central Scientific Instruments Organisation, Chandigarh; National Chemical Laboratory, Poona; U. P.

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EMC brings more power to Calcutta

Philippines delegation's visit to EMC stall at the Indian Engineering Trade Fair held in March 1975 in New Delhi : (*from left*) – Miss L. G. Tansinsin, Mrs L. J. Donato, Mrs R. de Leon, and Dr J. C. Srivastava (India)

Agricultural University, Pantnagar; and a number of private industries around. The Korean delegation recommended follow-up of the discussion and further exchange of information after the Indian delegation's visit in Korea. They also recommended mutual exchange of experts and trainees.

Fiji : The following members of the Fiji delegation visited India : Dr D. S. Pickering, Assistant Director, PWD (August 1974); Dr Ajit Singh, University of South Pacific (September 1974); Mr Elisha Daniel, Nagin Engineering Works (October 1974); and Mohd. R. Akbar, Resident, Vatuwaqa Industrial Association (February 1975).

Their visits and places of discussion included : Central Building Research Institute and Structural Engineering Research Centre, Roorkee; National Botanic Gardens, Lucknow; agencies concerned with roads and buildings; RRL, Jammu; Central Drug Research Institute, Lucknow; University College of Science and Bengal Immunity Research Centre, Calcutta; and other institutions and industries. In their report they recommended the introduction of herbal preparations in South Pacific rural areas, assistance of RRL, Jammu, in setting up a varnish industry using 'Makita' oil and an essential oil industry, and assistance in the setting up of a CSIO type centre in Fiji. In the engineering field, the delegation expressed interest in the setting up of a unit for bolts, nuts and screws (wood work); import of bicycle components; manufacture of plastic buckets, basins and spectacles; processing of hides and skins; and financial schemes for small industries.

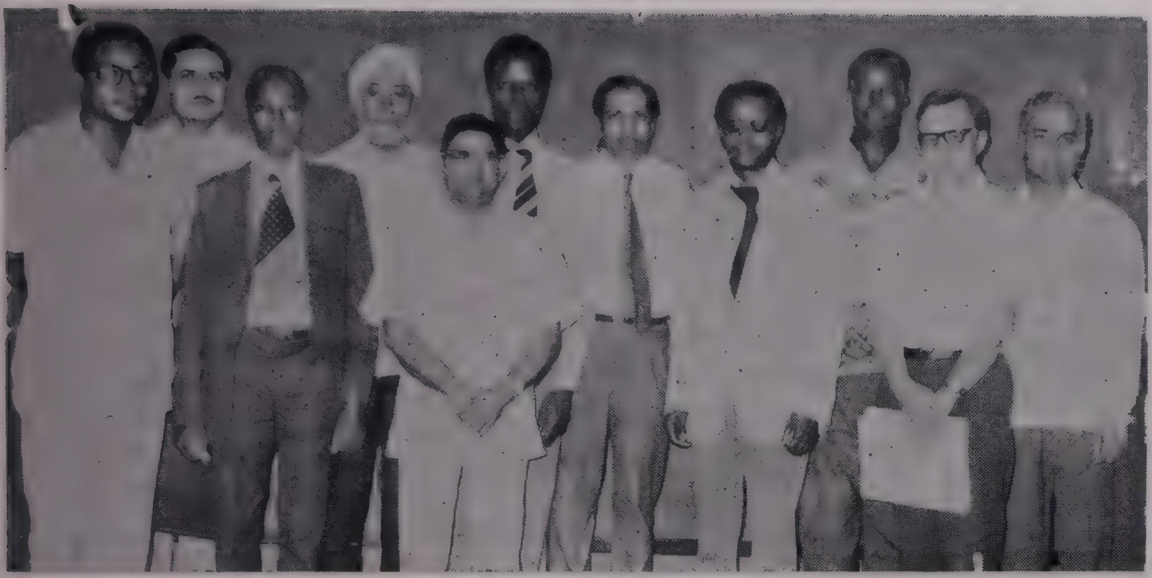
Philippines : The delegation consisting of the following visited India during February 1975 : Mrs R. de Leon, Senior Industry Specialist, National Economic & Development Authority (NEDA); Mrs L. J. Donato, Chief, Chemical Industries Division, Board of Investment; and Miss L. G. Tansinsin, Chief, Planning & Programming Division, National Science & Development Board (NSDB).

The Philippines delegation visited JK Synthetics, Kanpur; Central Scientific Instruments Organisation, Chandigarh; National Physical Laboratory, New Delhi; RRL, Hyderabad; Electronics Corporation of India Ltd and Small Industry Extension & Training Institute, Hyderabad; Central Building Research Institute, Roorkee; Central Salt & Marine Chemicals Research Institute, Bhavnagar; Central Leather Research Institute, Madras; Kissan Products, Bangalore; Central Food Technological Research Institute, Mysore; Indian Plywood Industries Research Institute, Bangalore; Government Silk Factory and other institutions and industries. Their recommendations include assistance from India in setting up an institutional framework of a Centre for Technology Transfer, exchange of scientists and continuing of exchange of information on technologies.

Indonesia : The Indonesian delegation, which visited India in March 1975, included : Mr S. Ukardi, Chief, Bureau of Capital Investment, Ministry of Industry; Mr Anwar Tamin, Chief, Technology Manpower, Department of Investment Coordinating Board; Mr G. Soedomo, Chief, Research Division, Institute for Industrial Research & Training (LPPI); Mr Wagijono Soemdinoto, Chief, Division of Pulp & Paper Industry, Directorate General of Chemical Industries; Mr Soekarno, Director for Development, Directorate General of Light Industries and Handicrafts; and Mr Eman Jogasara, Director, Technology & Economic Affairs, Directorate General of Basic Industries.

Their visits included organizations of small-scale industries, National Aeronautical Laboratory, Indian Institute of Science, RRL (Hyderabad), Small Industry Extension & Training Institute, JK Synthetics, Nationa Chemical Laboratory, Forest Researc Institute and other institutes and industries.

Kenya : The Kenya delegation consisting of the following visited Indi during May 1975 : Mr G. A. Owuo International Trade Officer, Ministr



Kenya delegation with Indian officials : (*from left*)—Mr H. R. Okwaro, Kenya High Commission; Mr R. K. Anand, Director, Ministry of External Affairs; Mr P. G. Githogori (Kenya); Mr Baldev Singh, Chief (Technology Utilization), CSIR; Dr J. C. Srivastava, Scientist, CSIR; Mr G. A. Owuor (Kenya); Dr A. Ramachandran, Secretary, Department of Science & Technology; Mr J. N. Mwangi (Kenya); Mr Samuel Obura (Kenya); Mr V. Kolchin, UNIDO Advisor; and Mr K. G. Krishnamurthi, Chief (Administration), CSIR

of Commerce & Industry; Mr B. M. Kikuvi, Mechanical Engineer (Projects), Kenya Industrial Estates Ltd; Mr P.G. Githogori, Industrial Engineer, Industrial Survey and Promotion Centre; and Mr S. B. Obura, Senior Research Officer, Sugarcane Production & Industry.

Their places of visit and study included : National Industrial Development Corporation, RRL (Hyderabad), Small Industry Extension & Training Institute, Indian Investment Centre, Mechanical Engineering Research & Development Organizations, National Sugar Institute, and a number of industries in private sector. The delegation expressed interest in tractors, oilseed processing, leather industry, tyre retreading, sugarcane processing, and a few other items.

Other countries : CSIR is in touch with Thailand, Malaysia, Bangladesh, Burma, Afghanistan, the Andean group of countries and UNIDO/UNDP to finalize the visit of delegations from these countries/organizations to India.

Consultation meetings

Leather Seminar : An international seminar on the Development of Footwear Manufacturing and Leather Goods Manufacturing Industries in developing countries was held in Madras during 4-13 February 1974. This provided a forum for the leather industry and the research institutions in India to project their capabilities to developing countries.

Agricultural Machinery Clinic : A ten-day Agricultural Machinery Clinic on animal-drawn agricultural implements, hand-operated machines and simple power equipment used in the least developed and developing countries was held in October 1974 in New Delhi. This was organized jointly by UNIDO and the Ministry of Agriculture, Government of India. The main objective of the clinic was to explore ways and means of promoting the local manufacture of appropriate agricultural machinery in the least developed and other developing countries. The clinic provided an opportunity for initiating transfer of know-how and bringing together concerned interests.

Status Reports and Case Studies

UNIDO has expressed interest in case studies to be undertaken on their behalf for low-energy technology with viable optimal operational size in the following areas so that India's experience and expertise could be used in other developing countries : Sugar manufacture; Cement manufacture; Fruit and vegetable preservation and utilization; Tannery and leather goods; Modern rice-milling; Salt industry; Low-cost housing; Foundry and forge factory; Ceramics; Reclamation of used engine lubricating oil; Manufacture of agricultural implements; and Utilization of agro-industrial wastes.

CSIR laboratories and other concerned agencies have agreed to take up the work.

The case studies suggested above could thus supplement the discussions and also help finalize the participating country's projects in consultation meetings.

In-plant training programme

India has accepted a UNIDO project to organize a training programme in April 1976 for personnel engaged in management and implementation of industrial research and development. The programmes are being finalized.

Promotional activities

UNIDO has made a proposal for the development of a low-cost small tractor (12-15 hp) with matching implements and equipment to be undertaken by the Central Mechanical Engineering Research Institute, Durgapur.

Technology Transfer Programme other than UNIDO Programme

Burma Pilot Plant : Pilot plants to be erected and commissioned in Burma with Indian assistance relate to Miltone, orange juice concentrate, gamma irradiator, workshop facilities, potassium schoenite, and menthol. Also included in the programme is supply of equipment from India for sodium alginate, manganese dioxide, calcium carbide, electrochemical metallurgy and bentonite schemes as also a distillation column and a pilot paper mill as teaching and research aid. The Burmese team consisting of three members visited India during July-August 1975 to make a first-hand study of the status of the projects and the equipment required for them as well as potential suppliers of equipment.

At the instance of the Ministry of External Affairs, CSIR arranged the visit of two Burmese salt experts in January 1975 to the Central Salt & Marine Chemicals Research Institute,

Technology Transfer Session of the UNIDO-India International Agricultural Machinery Manufacturing/Development Clinic—New Delhi, October 1974 : (*from left*)—Delegate from Tanzania, Rapporteur; Mr M. M. Mehta (India), Rapporteur; Dr A. Ramachandran (India), Chairman; Dr J. C. Srivastava (India), Vice Chairman; and Mr Swamy Rao, UNIDO Representative

Bhavnagar; Cellulose Products, Ahmedabad; and salt works in Gujarat and Tuticorin.

Sri Lanka : At the instance of the Ministry of External Affairs, CSIR agreed to the visit of a delegation from Sri Lanka's State Flour Mill Corporation to the Central Food Technological Research Institute, Mysore, in March 1975. The aim of the delegation was to identify and select the latest designs, specifications, equipment and machinery for producing byproducts of wheat and semolina. The delegation also acquainted itself with the technological research being conducted by the institute.

Radiography Laboratory Commissioned at MERADO, Madras

At a function held on 11 August 1975 at the Mechanical Engineering Research and Development Organisation (MERADO), Madras, Shri M. M. Krishnan, President, National Institution of Quality Assurance, and Manager, Quality Control, Sundaram Fasteners Ltd, Madras, commissioned a new Radiography Laboratory. Designed for non-destructive testing of castings, forgings, weldments and other materials, the laboratory will render assistance to the engineering industry by providing industrial radiography services—X-ray and gamma-ray. Apart from the basic radioactive source (cobalt-60 and iridium-90) cameras and X-ray machines of 200 kV and 300 kV capacity, the laboratory has facilities for quick and efficient material handling of products and components weighing up to 500 kg. Other facilities include a well-designed and quick-service dark room and other interpretation facilities like high-intensity illuminators, optical densitometers, and international reference radiographs of steel and aluminium for welds and castings.

Coinciding with the commissioning of the new radiography laboratory, a 12-day part-time training course in Non-Destructive Testing was also inaugurated by Shri Krishnan. Twenty-four trainees participated in the course; of these, twenty were from the middle management level of quality control personnel from industries in Madras and four were from the various units of the CSIR Madras Complex. In all, nineteen lectures were delivered. The lectures were amply illustrated by slide projections and practical demonstration classes. A few films on the topics of interest were also screened.

NPL Develops Mobility Aid for the Blind

The primary goal of a sensory aid is to assist the blind in moving safely. Several attempts have been made in the past to develop devices based on electromagnetic or sound-radiating systems or on ambient light reflected from the obstacle. Such devices achieved partial success and were limited in use because of bulk, restricted field, inapplicability in dark, rainy or foggy conditions and distractions of passers-by. Using ultrasonics, the National Physical Laboratory (NPL), New Delhi, has developed an auditory perception mobility aid for the blind. In this device, fabricated using indigenous materials and components, the information is obtained by the blind person through the sense of hearing. The device sends an ultrasonic beam of sweeping frequency (centred around 50 kHz) that bounces back due to reflection from an obstacle. The echo received is mixed with the transmitted signal and the resulting difference frequency signal (audio pips) is conveyed to the user through earphones. For reflection from a stationary object the beat note is constant and proportional to the range of the reflecting object. The distance of the obstacle can thus be ascertained through variation of the pitch of the sound. The amplitude of pips is a function of the reflecting property of the object as well, and if there is an array of objects in the probed direction, a similar audio pattern results.

The device can be switched on by three switches and is powered by small

Mobility aid for the blind developed at NPL, New Delhi

9V cells of 216 type. The generation and reception of ultrasonic waves is achieved by dielectric type transducers which have an uniform response over a wide band. Transistorized circuits have been designed for the entire unit for performing various operations such as swept frequency transmission, converter biasing and reception. Bulk and background noise have been sliced stage by stage, culminating eventually in a torch-shaped model, 30 cm in length. The device is silent when no obstacle is present. The current drain has also been reduced and the device is made relatively secure against damage from mishandling.

Another pocket-size model, 15 cm in length and 500 g in weight, has been developed using integrated circuits. The device gives clear tones when any obstacle, such as a wall, can be detected easily from a distance of 4·5 m. By suitably holding the device, one can negotiate obstacles like buildings, trees, poles, bushes, railings and human beings, besides getting information about sharp movement and any large breach on the ground such as ditch.

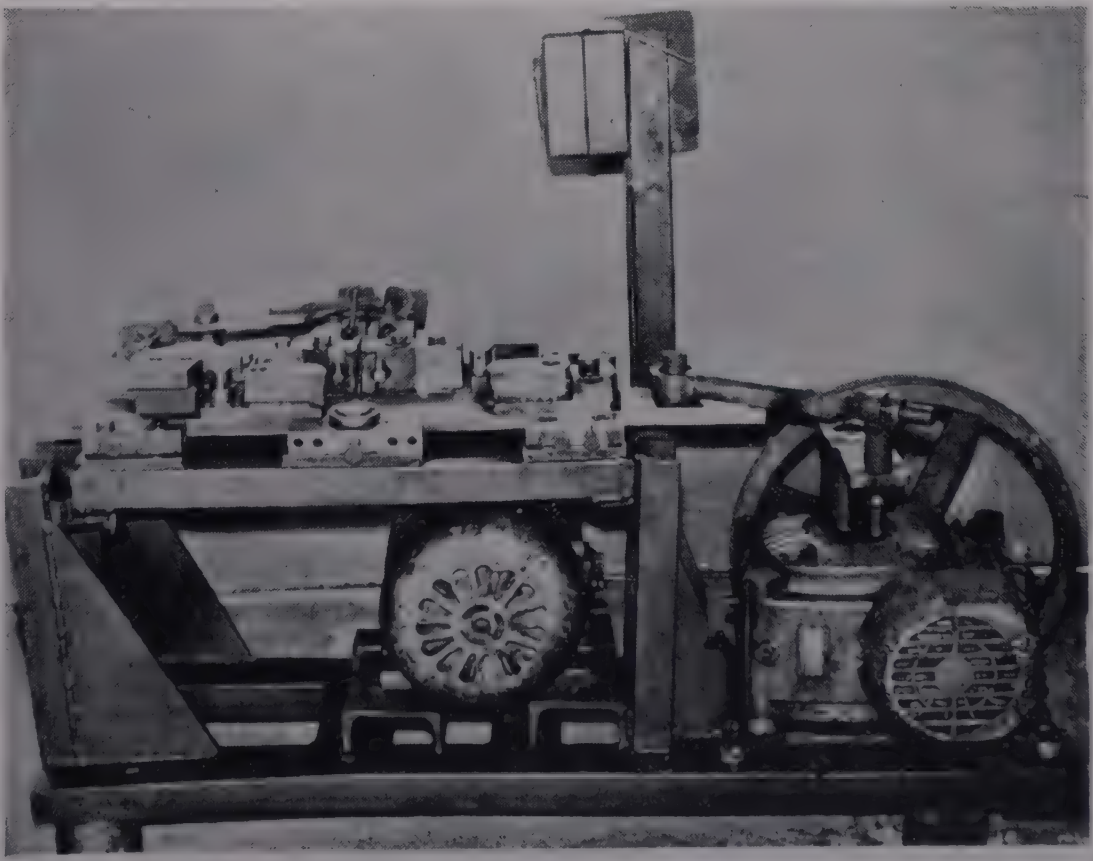
Ideally, a mobility aid should be able to detect obstacles at least 6 ft ahead, large or small, upward or downward discontinuity, with good general orientation; should be light-weight (less than 4 lb), handy (less than 4 in. cube), inconspicous, unaffected by noise or day-light, and reliable, providing easy battery replacement. The information given by the device should be interpretable by the blind so that he can avoid obstacles while walking with moderate speed. The NPL device meets almost all the above requirements.

The device, torch-type, has been released to some institutions for the blind, besides being shown at the National Exhibition for the Handicapped. Response from the blind has been very encouraging.

MERADO Develops Structural Rod/Flat Bending Machine

Structural rod/flat bends in the cold condition in the form of a sine wave (with an included angle of about 90°) are used in building structures, industrial grate floorings and gangways. The bending of rods/flats has so far been a manual process with the drawbacks of nonuniformity of bends and low productivity.

The Mechanical Engineering Research and Development Organisation (MERADO), Poona, has designed and developed a structural rod/flat bending machine which automates the bending process with improved quality and productivity. The machine is portable



Structural rod/flat bending machine developed at MERADO, Poona and can, therefore, be used at construction sites also.

The machine consists of a base plate over which a rectangular bar, carrying two bending blocks, reciprocates in front of two dies secured to the base plate. The rod/flat is inserted between the dies and is bent by the bending blocks in the alternate direction as the rectangular bar reciprocates. The rod/flat is pushed forward by a cam-operated linkage.

The specifications of the machine vary with the size of the rods/flats and with the size of the bends. A typical specification of the machine is as follows :

Size of flat : 3 mm thickness and 12 mm width
Size of bend : 40 mm (height) × 80 mm (pitch)
Rate of production : 2 m/min
Motor : 0·75 kW, 1500 rpm, single phase, squirrel cage induction motor
Size of machine : $1000 \times 500 \times 300$ mm
Weight of machine : 75 kgf

Experimental Houses Constructed at Roorkee using CBRI Techniques

The Municipal Board, Roorkee, has completed the construction of the first four-storey block of 16 houses at Roorkee with technical guidance from the Central Building Research Institute (CBRI), Roorkee. Prof. Dinesh Mohan, Director of CBRI, who formally opened the houses on 7 September 1975, highlighted the CBRI techniques used in the construction of these houses, viz. under-reamed piles for foundation, single-brick load-bearing wall and half-brick thick party-wall in all the four floors, use of prefabricated members such as R. C. frames for doors and windows, thin lintels, shelves and R.C. solid planks and partially precast R. C. joists for floor/roof and single-stack system of plumbing. The adoption of these new techniques has not only led to savings in cement (20%) and steel (15%) but has resulted in an overall economy of 19%, and has provided increased floor area in the lower two floors. This is the first construction at Roorkee of a residential block in four storeys on single-brick thick load-bearing walls. All these techniques are simple and do not require heavy capital investment or any mechanical handling equipment.

Offshore Mineral Exploration by NIO

India has large deposits of heavy mineral placers on the beaches in Maharashtra, Kerala, Tamil Nadu, Orissa, Bihar and West Bengal, and these contain magnetite, ilmenite, monazite, garnet, etc. Some of these deposits are being exploited at present. The onshore occurrence of these minerals on the beaches is an indication of the possible occurrence of similar placer deposits in shallow offshore areas. These submerged placers appear to have been formed more than 10,000 years ago when the sea level was lower because of extensive glaciation on land. This clue has been successfully used to explore the offshore heavy mineral placers in other countries, and substantial export market for these minerals from submerged placer deposits has been built up by several countries. Little is known about the offshore extension of the placer deposits on Indian beaches.

The National Institute of Oceanography (NIO), Panaji, has recently initiated an extensive survey of the shallow offshore areas to explore the heavy mineral placers and assess their potential. The laboratory has already carried out a detailed survey in the Kalbadevi, Mirya and Ratnagiri bays in Maharashtra. The surveys have been carried out on a scale of 1 : 10,000 and include bottom sampling, bathymetry and magnetics. These will be followed by continuous shallow seismic profiling. More than 400 samples from the bottom have been collected and echosounding of 76 line kilometres and magnetic surveys of 130 line kilometres have been carried out. The data and samples collected are being studied at NIO and other CSIR laboratories. Such surveys would be extended to other localities on the west coast of India during 1975-77.

BTRA's Achievements Highlighted at its Annual General Meeting

The twenty-first annual general meeting of the Bombay Textile Research Association (BTRA), Bombay, was held on 2 August 1975. While addressing the meeting, Shri R. R. Ruia, Chairman of the Governing Council of BTRA, observed that despite the crises and problems of inflation and power shortage, the textile industry was able to provide continuing support to research and the Association did its utmost to help the industry effect overall improvement. The growing membership was cited as the index of the industry's recognition of BTRA's contributions. Shri Ruia highlighted BTRA's recent achievements, a brief account of which is given below.

Researches in spinning have led to substantial reduction in end breakages and improvement in yarn quality and productivity through optimum settings, control over doubling tension, use of crush rolls in carding, and rescheduled cleaning operations. In weaving, the mono-step dyeing-cum-sizing process for warp continued to draw interest. Work on the substitution of imported cottons has led to improvements in the weaving performance of 100% Indian cotton yarns. A number of new developments in chemical processing have been released free of cost to the member mills; amongst these are the processes relating to dual feel for printed organdie, polychromatic printing, transparent printing on all-cotton and cotton/polyester blends and increased uptake of reactive dyes for cellulose goods in exhaust dyeing. The process for creating 'broken effects' by printing is another importan development. Practical guidelines fo effective substitution of kerosene in pigment printing have been worked out The electrolytic process for reducin sodium hydrosulphite consumption i dyeing has been implemented in 2 mills on 27 jiggers and eight continuous dyeing ranges, resulting in savings of several lakhs of rupees.

The recent developments in engineering and instrumentation are : a device to check gear run-out, yarn tension meter and a hydraulic picking stick buffer. The ring ovality tester, traveller stretch tester and ring cleaner, developed earlier, have been made available to mills.

Shri Ruia felicitated Prof. E. H. Daruwalla and Shri S. D. Supanekar for winning the NRDC's invention award announced on the Republic Day (1975).

Speaking at the meeting, Shri T. V. Ananthan, BTRA's Director, mentioned the possibility of regenerating 80 to 90% of used spindle oil at a cost of about 5% of the fresh oil. He announced that a project aimed at improving the durability of cotton materials to abrasion would be taken up. A few mills had started regular in-house R & D activities with the assistance from BTRA, he added.

Prof. E. H. Daruwalla, Research Adviser to BTRA, stressed the importance of maintaining a balance between short-term researches which satisfy the immediate requirements of member mills and long-term projects which would create a proper image of the organization in the sphere of textile research. He said that a school of research would be established in the next five years for dealing with the principles involved in wet-processing of textiles.

Awards were distributed to 14 scientists for outstanding work. An exhibition was also held from 4 to 6 August 1975 depicting the Association's achievements.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Improved Canning of Shrimp

Shrimp canned in brine is exported from India and the value of exports amounts to Rs 30 million per annum. At present, shrimp is being canned by the fish-processing industry, mostly on the west coast, and the present indigenous production is estimated at 2200 tonnes. There appears to be ample scope for establishing internal as well as external trade in this product. It is estimated that in the next five years, demand for canned shrimp would be about 6000 tonnes per annum. Present market price of this product is about Rs 4 per can (8 oz; drained wt, 5 oz).

In order to produce a ready-to-eat product, the Central Food Technological Research Institute (CFTRI), Mysore, has developed an improved process for canning of shrimp in brine. In the process, prawns are passed through beheading, peeling and de-veining operations and are thoroughly washed and brined for a certain period. They are then placed on stainless steel wire netting with receivers which are put in a trolley and inserted in standard-size autoclaves. Live steam at atmospheric pressure is passed through the autoclave till the prawns are properly blanched. The exudate is centrifuged and the clear juice is added into the cans containing blanched prawns. Each can contains 5 oz of blanched prawns and about 60 ml of clear juice. After properly exhausting, the cans are processed with steam of requisite pressure for a certain period, and cooled and labelled.

Three hundred cans were prepared by working out about two dozen batches. The process of canning shrimp in brine is well known commercially. Hence, no particular experiment was carried out on the steps used in the canning industry. However, the improvements in the process, consisting of bringing the shrimp with an exact quantity of salt of adequate quality and adding back the exudate of the blanched shrimp to improve its flavour, have been worked out in detail. The stainless steel mesh and receiver for separating the exudate have been designed and fabricated. The product obtained has been tested and found to conform to specifications.

Prawns used for canning should be fresh, sound, properly cleaned and free from entrails, and should be properly peeled before canning. Refined salt conforming to IS : 594-1962 should be used. The prawn catch constitutes 25% of the annual catch of marine fish approximating to 1·7 lakh tonnes. As such, sufficient quantities of prawn are available indigenously.

For effecting the improvements in an existing prawn-canning industry, the following equipment are required : basket centrifuge or vertical-type centrifuge, stainless steel wire netting and receiving trays. All these are available indigenously.

The total investment required for setting up facilities to process one tonne of shrimp per day by the improved method is estimated at Rs 28,000. The extra cost of processing due to incorporation of this improvement is estimated at Rs 35 per tonne of shrimp.

Further details of the process can be had from : The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

First-Aid Chemical Foam Extinguisher

With the exception of the first-aid chemical foam extinguisher, all first-aid fire extinguishers are capable of upright operation. The first-aid chemical foam extinguisher capable of upright operations has many advantages. The Central Building Research Institute (CBRI), Roorkee, has developed such a fire extinguisher. The device meets the specifications and characteristics specified in IS : 933-1967 in general and of length of jet, minimum period for maintenance of jet and maximum period for discharge in particular.

Four prototypes of the first-aid chemical foam extinguisher (upright-operated type) have been made by the institute. These extinguishers are meant for small class 'B' fires. It is also possible to convert the inverted-type first-aid chemical foam extinguisher into upright-operated type using the CBRI technique.

Firms engaged in the manufacture of inverted-type first-aid foam extinguishers can easily make the first-aid chemical foam extinguisher (upright-operated type) with no additional machinery. For setting up a fresh unit, the equipment required are lathes, sheet cutter, roller, and gas welding plant. The raw materials required are steel, sheet, brass, etc.

A unit capable of manufacturing 6000 extinguishers per year will require a fixed capital of about Rs 1·85 lakh and a working capital of about Rs 3·00 lakh. The cost of production is estimated at about Rs 170 per extinguisher. The price of the upright-operated extinguisher would be higher than that of the inverted type by about 5-10%.

Further details can be had from : The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Dr Mathur Elected FNA

Dr H. B. Mathur of the National Chemical Laboratory, Poona, has been elected Fellow of the Indian National Science Academy, New Delhi, and Indian Academy of Sciences, Bangalore.

Leather Week and Tanners' Get-together

The Central Leather Research Institute (CLRI), Madras, will be organizing the 'Leather Week' and the Tanners' Get-together from 31 January to 6 February 1976. The subject of the get-together will be training programmes and management sciences for leather and allied industries. The get-together will be held in five sessions : Broad perspectives on technical training for leather and allied industries; Specialized aspects of technical education and management sciences in leather and allied industries; National and international collaboration for the development of technical training in leather and allied industries; Views forum; and CLRI's Research programme for 1976-77.

Papers to be considered for presentation at the get-together should be sent to the Conveners, Eleventh Tanners' Get-together 1976, Central Leather Research Institute, Adyar, Madras 600020. The abstracts of papers should be sent before 15 November 1975 and full papers by 1 December 1975.

Man-made Fibres for Developing Countries : International Conference

The Silk & Art Silk Mills' Research Association, Bombay, in association with the Union Ministry of Petroleum and Chemicals, is organizing an international conference on Man-made Fibres for Developing Countries from 18 to 23 January 1976 in New Delhi.

The conference will bring into focus the prospects for growth and development of man-made fibres for developing countries, and will cover discussions on : economics and trade; raw-materials technology of fibre, yarn, fabric and machinery; and military, industrial and apparel applications of man-made fibres, including design and fashion. An exhibition will also be organized to project the end use applications of various man-made textiles all over the world.

Further details can be had from : Shri J. G. Parikh, Director, The Silk & Art Silk Mills' Research Association, Dr Annie Besant Road, Worli, Bombay 400025.

PATENTS FILED

69/Cal/75 : A process for obtaining D-xylose xylit from corn (*Zea mays*) cobs, J. L. Bose, D. D. Nanavati & S. G. Limaye—NCL, Poona.

217/Cal/75 : A process for making prestressed concrete poles using high-strength deformed bars and portable/disposable stressing beds, Z. George, N. Sethuraman & A. Chellappan—SERC, Madras.

363/Cal/75 : A process for the synthesis of substituted benzoxazine and naphthoxazine-2-thiones, Smt R. Bindra, Harindra Singh, Satyavan Sharma, R. N. Iyer, S. K. Avasthi, Jagdish Kumar & O. P. Srivastava—CDRI, Lucknow.

416/Cal/75 : Engineering fits feeler, O. P. Sethi, P. S. Malhotra, B. D. Sharma & P. K. Garg—CSIO, Chandigarh.

417/Cal/75 : Preparation of aminopolyols using CNSL and making polyurethane rigid foams, N. D. Ghatge & K. B. Gujar—NCL, Poona.

421/Cal/75 : A process for the synthesis of 9.11-seco-estradiol and its derivatives, P. L. Kole, Suprabhat Ray, V. P. Kamboj & Nitya Nand—CDRI, Lucknow.

464/Cal/75 : Improvements in or relating to continuous fluid-bed reactor for gas-solid reactions, M. Ramacharyulu, N. N. Ramakrishnan, R. Vaidyeswaran, R. N. R. Palieah & M. A. Knaleel Akmal—RRL, Hyderabad.

477/Cal/75 : Improvements in or relating to electrolyte for etching of aluminium and its alloys for direct plating of metals, B. A. Shenoi—CECRI, Karaikudi.

575/Cal/75 : Improvements in or relating to a process of electrolytic production of iron powder/iron of high purity from iron chloride solution using insoluble anode, V. M. Pandey S. K. Jain & P. K. Jena—RRL, Bhubaneswar.

576/Cal/75 : Construction of eddy current precision wire tensioner, Durgappa Rajanna—NAL, Bangalore.

579/Cal/75 : Precision linear feed movement device, D. K. Pramanik & G. Doraiswamy—CMERI, Durgapur.

588/Cal/75 : A process for the manufacture of semiconductor devices such as mesa devices, R. P. Gupta & J. P Pachori—CEERI, Pilani.

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CSIR NEWS

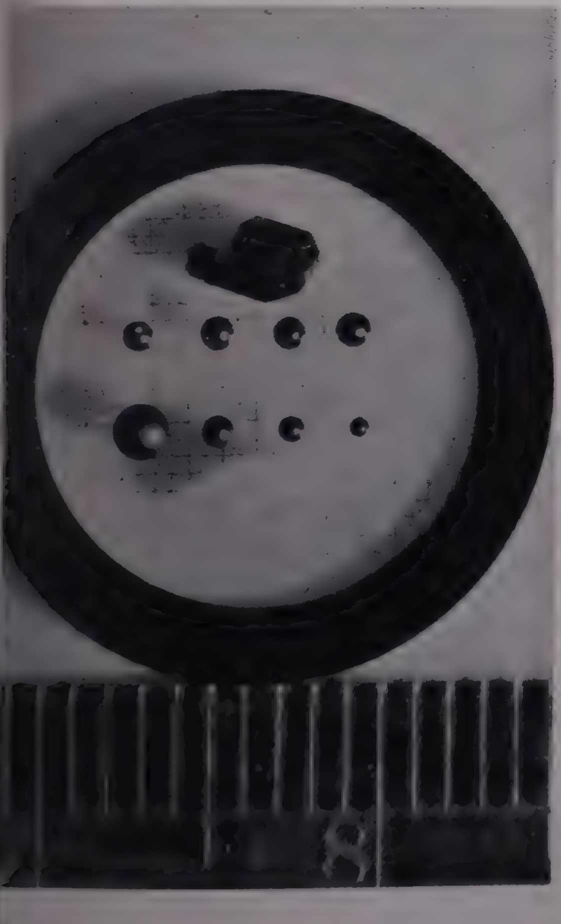
A FORTNIGHTLY HOUSE BULLETIN OF CSIR

VOL. 25 30 OCTOBER 1975 : 8 KARTIKA 1897 NO. 20

CGCRI Develops Polished Spheres of YIG Single Crystals

YIG (yttrium iron garnet) single crystals are used extensively for tuned filters. For this purpose YIG polished spheres in the diameter size range 0·015 to 0·030 in. with a tolerance limit of ± 0·001 in. are required for oriented mounting in the microwave devices. Specifications required for this purpose are : saturation magnetization $(4\pi M_s)$, 200-1780 gauss; and Curie temp., 560 ± 5°K.

Single crystals of YIG have been grown at the Central Glass & Ceramic Research Institute (CGCRI), Calcutta, using the fluxed fusion technique, and polished spheres have been processed from them.



ingle crystals of yttrium iron garnet grown
nd processed at CGCRI for use in electro-
ic device applications

The photograph shows an as-grown YIG single crystal, eight spheres derived from each such single crystal at various stages of processing, and a rice grain kept alongside for the sake of comparison. The adjacent scale is in centimeters. A set of four spheres adjoining the as-grown crystal are highly polished, though still much larger than the largest spheres required for device applications, whereas the other four crystals are at various stages of grinding and polishing.

The project on YIG and the YAG (yttrium aluminium garnet) single crystals has been sponsored by the Electronics Cell of CSIR.

IIP's Survey of Diesel Oil Requirements in Agriculture Sector

Diesel oil (light diesel oil and high-speed diesel oil) being one of the important inputs to maintain and accelerate the growth of the agriculture sector, accurate assessment of its demand and future projections for both *rabi* and *kharif* crops is very important. Moreover, owing to steep increase in the price of crude oil and consequently greater outflow of foreign exchange, the need for accurate assessment of diesel oil requirements and their proper distribution and utilization typewise for genuine use in the agriculture sector has been appreciated by the Ministry of Petroleum and Chemicals.

Accordingly, this Ministry, in consultation with the Ministry of Agriculture, assigned (in June 1975) to the Indian Institute of Petroleum (IIP), Dehra Dun, the project on market research for diesel oil requirements in the agriculture sector. The methodology for conducting this project consists of two parts : (i) postal survey, and (ii) field survey.

A number of questionnaires have been designed to elicit information from different sources such as State Directors of Agriculture, District Agriculture Officers, Block Development Officers, agriculture universities, state farms, horticulture farms, animal husbandry farms, military farms, tractor/diesel engine manufacturers, etc. down to the level of the actual worker in the field. Questionnaires have also been sent to some progressive farmers. The objective of the postal survey is to determine the statistics of the population of the agriculture equipment/machinery using diesel oil and also the norms of operation.

Arrangements have also been finalized for conducting field surveys in almost all the leading crop-producing states. In each such state, important districts and blocks have been chosen based on the intensity of agriculture and method of irrigation for collecting the field information. This field information comprises mostly operating norms such as type of fuel, specific fuel consumption, operating hours of the machinery in *rabi* and *kharif* crops, and load factor.

Data collected in these surveys will be processed and the requirements of diesel oils for each state and also on all-India basis will be computed. The project is likely to be completed in December 1975.

This is a major collaborative effort by various agencies of the Government of India and state governments and the Indian Institute of Petroleum to rationalize the use of diesel oils for agricultural uses.

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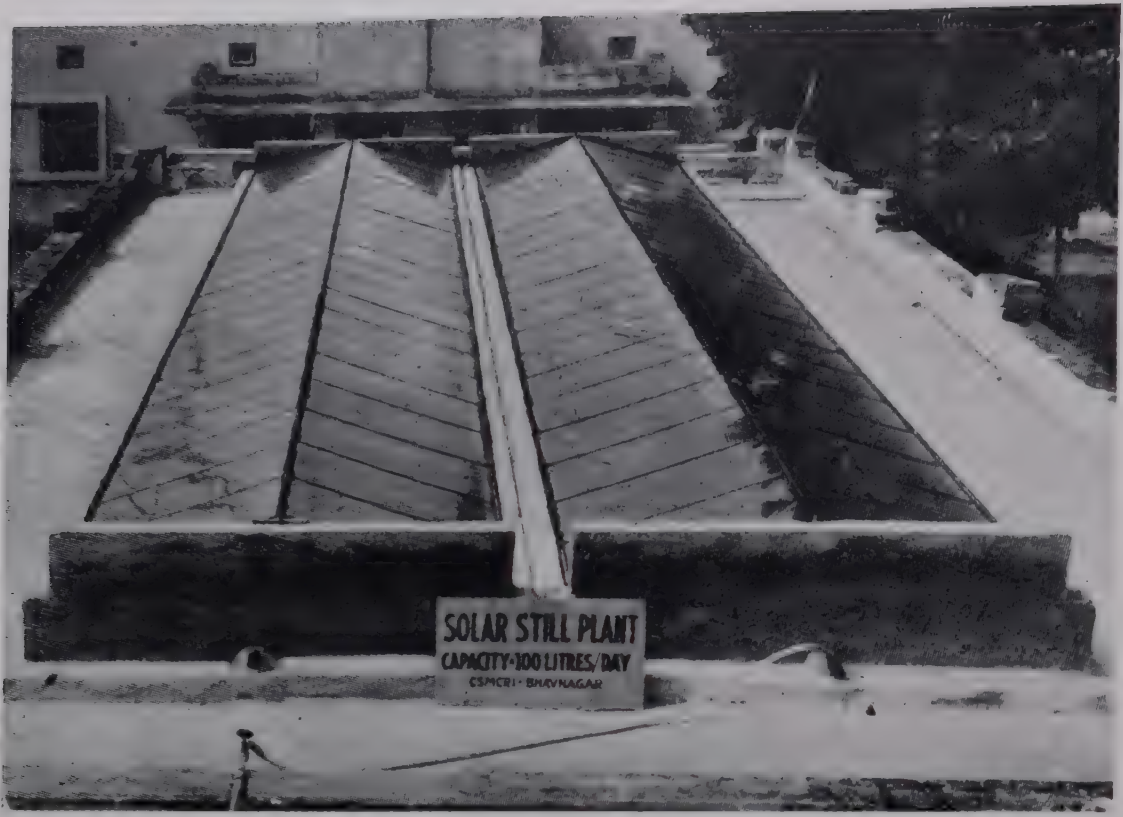


Solar still plant for distilled water installed at CSMCRI

Solar Still Plant for Distilled Water Installed at CSMCRI

A solar still plant of 100 litres per day capacity has been constructed on an area of 2×20 square metres over the terrace of the garage at the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar. This plant, which uses solar energy, meets the institute's bulk of the normal daily requirement of distilled water. Similar designs have been given to some of the CSIR laboratories and also to other research and educational institutions in the country. There would be substantial saving of artificial energy by the use of such stills for producing distilled water.

Purification and Re-use of Used Salt for Curing : CLRI's Process

A simple and economical method of purification of used salt for re-use in curing of hides and skins has been developed by the Central Leather Research Institute (CLRI), Madras.

The dumping of used salt causes environmental pollution (of soil and water) and re-use of the used salt for curing causes deterioration in the quality of the skins and leathers. The utilization of used salt after purification eliminates these disadvantages.

The process developed by CLRI is as follows :

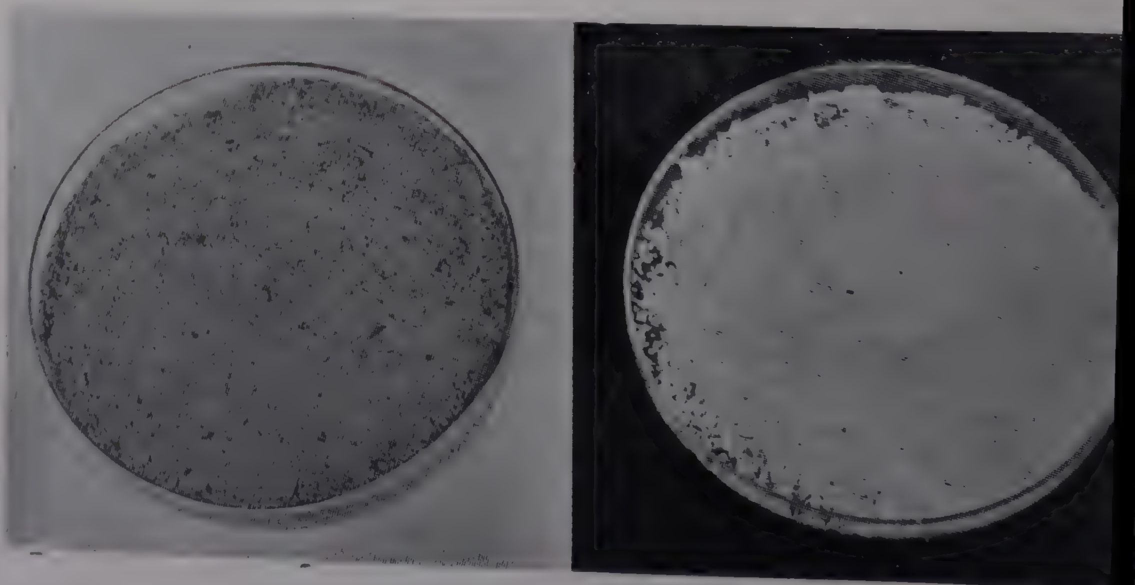
Saturated brine of used salt is allowed to sediment in a tank for 48 hr to remove insolubles and to reduce bacterial contamination considerably. The supernatant is decanted and solar-evaporated to dryness in open, cemented yard. The recovery of salt is 75-80% with 95% NaCl content. The purified salt is found to be better than t
available market salt in all respects.

Goat skins were cured with fresh a
purified salt (40% on weight of ski
and stored separately at 28 ± 1°C f
80 days. The extent of deterioration
the quality of skin has been studi
bacteriologically and chemically duri
the period of storage.

It has been found that the purifi
salt can be used by the tanner for cu
ing and pickling. It is much bett
than the market salt because of lo
contamination of bacteria. The quali
of leather from skins cured with pu
fied salt is found to be superior to th
of fresh salt; the grain damage bein
highly perceptible in skins cured wi
fresh salt which is available for curin
Also, environmental pollution can
avoided. Further, the addition of tr
chlorophenate to the recovered sa
improves the efficiency of curing.

The economics of the process ha
been worked out for a tannery proce
sing 500 wet-salted skins per day.

Approximate amount of shake-off sa
obtained : 75 kg (150 g/skin)
Amount of purified salt that will
obtained : 56 kg (75% of shake-o
salt)
Cost of masonry tank for preparin
salt solution and for evaporatin
shallow tanks, filtration, siphoni
devices, labour, etc. : Rs 1700
Amount of salt (purified) obtained
25 days : 1400 kg



Used salt (*left*), purified salt (*right*)

Price obtained for used salt when sold as such at 12 P/kg (1875 kg) : Rs 225/month
Price for market salt of the same quantity : Rs 450/month
Margin of profit : Rs 225/month

The total investment could be realized in about 7 months.

Maturation of Mammalian Red Blood Cells

Reticulocyte represents a critical phase of differentiating erythropoietic cells. When it matures to the terminal erythrocyte phase, the reticulocyte undergoes profound morphological and functional transformation. Studies of these changes at the molecular level can lead to a better understanding of the control mechanism and also provide a model for the study of membraneogenesis. Shri Chigurupati Raja Babu has carried out such studies in the Biochemistry Division of the Central Drug Research Institute (CDRI), Lucknow. On employing experimentally induced reticulocytosis by phenylhydrazine, rabbit reticulocytes were found to be four times as active as mature erythrocytes in transforming *in situ* formed [^{14}C] ATP into [^{14}C] cyclic AMP. Similarly, anaemic human RBC showed higher activity in effecting this transformation. On prior exposure of cells to epinephrine the synthesis of cyclic AMP was stimulated in rabbit reticulocytes and in anaemic human RBC, but not in erythrocytes. It appears that during maturation there was loss of epinephrine-stimulated synthesis of cyclic AMP. [^{3}H] Epinephrine binding experiments with the stroma fractions prepared from reticulocytes and erythrocytes showed, however, similar binding characteristics; the loss of hormone sensitivity in the mature erythrocytes could be due to a conformational change of the enzyme adenylate cyclase during maturation.

Analysis of membrane composition revealed drastic reduction in the contents of various fractions of carbohydrates, lipids and proteins. Although the cholesterol/phospholipid ratio was not altered much, there was a significant change in the protein/lipid ratio. Many enzymes, both membrane-bound and those located in the soluble portion, were present in reduced levels in erythrocytes compared to those in reticulocytes. A nonspecific soluble acid phosphatase has been resolved into three components on elution from DEAE-cellulose column, whereas the enzyme from reticulocytes separated into two components. No significant differences were found between reticulocyte and erythrocyte isozymes, even though the isozymes from a single cell population differ in their properties. Considerable differences in properties were observed between membrane-bound soluble acid phosphatases. These studies formed part of the work leading to the award of Ph.D. degree to Shri Ch. Raja Babu by the Banaras Hindu University, Varanasi.

Dr Mitra (NPL) Elected Vice Chairman of URSI Commission on Ionosphere

Dr A. P. Mitra of the National Physical Laboratory (NPL), New Delhi, has been elected Vice Chairman of Commission-III (Ionosphere) of the International Scientific Radio Union (URSI) at its general assembly meeting held in Lima, Peru, in August 1975. Dr Mitra is the first Asian to be elected to this international office. Dr Mitra will serve as Vice Chairman for 1975-78 and will automatically become the Chairman for the period 1978-1981.

Dr Mitra led the Indian delegation to the eighteenth general assembly of URSI held during 9-20 August 1975 in Lima, Peru. The general assembly of URSI, held once in three years, is the most important international event in radio science. URSI includes eight commissions, covering the following disciplines : Radio Measurements and Standards, Radio and Non-ionized Media, Ionosphere, Magnetosphere, Radio Astronomy, Radiowaves and Circuits, Radio Electronics, and Radio Noise of Terrestrial Origin. Besides Dr Mitra, the Indian delegation consisted of Prof. Govind Swarup (Tata Institute of Fundamental Research, Bombay), Prof. B. R. Nag (Calcutta University), Prof. S. V. C. Aiya, Prof. R. G. Rastogi (Physical Research Laboratory, Ahmedabad), Prof. C.S.G.K. Setty (Delhi University) and Prof. V. Radhakrishnan (Raman Research Institute, Bangalore). A brief report of the conference prepared by Dr Mitra follows.

URSI introduced this time the concept of an open symposium in addition to special sessions under each commission. The open symposia were on (i) Equatorial Ionosphere (Symposium A) in which about 150 papers were presented, including several from India, and (ii) Non-stationary Signal Analysis (Symposium B). The topics discussed in Symposium A included the morphology and dynamics of the equatorial ionosphere, the problems of equatorial irregularities and scintillations and of trans-equatorial propagation. Amongst the other sessions in the field of ionosphere, one of the most interesting concerned the scientific results and communication potentialities of a new scientific effort involving 'artificial heating of the ionosphere'. The experiments have been carried out mostly in USA, in Boulder, Colorado, and in Arecibo where the ionospheric F-region (as well as partly of the D-region) have been artificially modified through heating with high-power HF ground-based radio transmitters at frequencies slightly below the critical frequency of the F-region. The transmitters have power-aperture products around $10^4 \mu\omega m^{-2}$. As a consequence, field-aligned ionospheric irregularities are artificially generated, which provide a large radar cross-section, ranging from as high as 10^9 m^2 at HF to 10^4 m^2 at UHF. This has opened up a new and powerful channel of useful over-the-horizon communications for radio frequencies as high as UHF.

Amongst the specialized topics discussed in the different sessions the following were of special interest : Remote sensing of surface and underground characteristics of the earth; Artificial heating of the ionosphere and its efforts; Radio noise models; Theory

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and results of studies of the lower atmosphere by acoustic methods; Global models of the ionosphere including the international reference ionosphere; Millimetre and sub-millimetre techniques; Advances in incoherent scatter; Interaction of radiofrequency fields with biosystems; Optical communication; International comparison of standards; Microwave solid state devices; Josephson junction as an element in electronic measurement systems; Antennas for satellite communication; and Computer simulation of communication systems.

URSI has, for some time, been concerned with a major reorganization of its structure and objectives, and in particular, on the overlap in geophysics areas with IAGA. It was agreed that URSI should be concerned principally with the scientific aspects of telecommunications using electromagnetic waves, guided or unguided, and that its reorganized activities and commissions be organized in the following areas :

Commission A	*Electromagnetic Metrology* (including radio standards and biological interactions)
Commission B	*Fields and Waves.* Electromagnetic theory and practice (including antennas and wave-guides)
Commission C	*Signals and Systems.* Communications systems and system theory (including circuits); information theory and signal processing (including fluctuation problems)
Commission D	*Physical Electronics* and devices.
Commission E	Electromagnetic *Interference Environment*
Commission F	*Wave Phenomena in Non-ionized Media* (including radio meteorology, radio-oceanography and remote sensing of non-ionized media)
Commission G	*Ionospheric Radio* and propagation (including ionospheric communications and remote sensing of ionized media)
Commission H	*Waves in Plasmas*
Commission J	*Radioastronomy* (including remote sensing of celestial objects)

Important points to note are the special emphasis on biological interaction of electromagnetic waves, introduction of radio-oceanography and splitting the old Commission VI into two Commissions : Fields and Waves; and Signals and Systems.

Dr Mitra was also appointed Chai
man of the Standing Committee o
General Assemblies and continues
be URSI representative on the Inte
national URSIGRAM and World Da
Service.

Dr Majumdar (NPL) Honoure

Dr S. C. Majumdar of the Nation
Physical Laboratory, New Delhi, ha
been awarded the J. C. Bose Premiu
for his paper "Some observations o
distance dependence in tropospher
propagation beyond radio horizon
published in the Journal of the Institu
tion of Electronic and Radio Engineer
(UK) in 1974. This award has bee
given to him for making the most ou
standing contribution during 1974.

Progress Reports

CMERI Annual Report : 1972-73

The Central Mechanical Engineering Research Institute (CMERI), Durgapur, has brought out its annual report for 1972-73. The 124-page report (royal 8vo) shows that the institute's R & D activities were in the following subdisciplines : Applied mechanics; Applied science; Automobile engineering; Heat, power and refrigeration; Materials; Product development and industrial design; and Product engineering. A number of research problems like turbulent gaseous flames; pulsating combustion, pulverized coal flame and flame stabilization technique have been solved. The report also records the activities of the service divisions and MERADO centres of the institute. Work on the design of bottling plant, sweet-wrapping machine, wool-carding machine and friction-welding machine was under way at various MERADO centres. The institute earned a sum of Rs 7·12 lakh against the financial inputs of Rs 21·88 lakh during the period covered by the report.

On the basis of the design of 10 hp engine for power tiller, developed
by the institute, the Garden Reac
Workshops, Calcutta, fabricated
prototype of the engine. Initial tes
were conducted to check the lubrica
ing system, etc. The powered cyc
rickshaw developed by CMERI ha
successfully gone through various roa
trials.

The institute carried out extensiv
investigations on the fluidized be
combustion boiler to ensure hig
quality heat release rate and high he
transfer coefficient and reduction in th
size of the boiler and in the overall co
of the unit. Following a feasibility stu
of a boiler of 1500 lb/hr, a test boil
(500 lb/hr) for generating design da
of a prototype was developed ar
erected. Investigations have yield
encouraging results and the design
a prototype of package boiler of 80
lb/hr at 14 atm. pressure has be
completed.

The high-output combustors of pr
sent day are required to handle lar
mass flow within a limited space, a
a study on the suitable design of co
pact flame stabilization system has b
come essential. CMERI has made
perimental and theoretical investi

tion on the turbulent mixing region, assuming a flow variable with distance at the lower edge of the mixing region. The measured velocity profiles in the mixing region of a shallow cavity were found to be in good agreement with those obtained theoretically. The study of flame stabilization process and test rig for studies of the fundamental work are nearing completion.

Test results of a prototype of generative pump agreed well with the theoretical predictions. The pump was designed to develop a maximum head of up to 30-40 m and maximum discharge of 65 to 70 litres/min with a maximum efficiency of about 35%. With minor modifications two more prototypes of different sizes have been made.

The soldering processes developed by the institute for joining aluminium to aluminium and aluminium to copper using flux have been released to two firms, viz. Voltas Ltd, Thana, and the Standard Radiators Pvt. Ltd, Baroda. The institute has also undertaken a project for making friction welding machine.

To help the filter-manufacturing industry in inspection and quality control of products the institute has developed test rigs for fuel oil, lubricating oil and air filters. Drawings of the test rigs have been supplied to the Central Institute of Road Transport, Poona.

Know-how on heat-sealing machine, reaper binder and shell ice-making machine was ready for commercial exploitation.

The institute prepared a comprehensive plan for the establishment of four additional MERADO/Extension Centres to be set up in other states during 1974-79.

ATIRA Annual Report : 1974-75

The annual report of the Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad, for 1974-75, published recently, records the progress of R & D work under the following disciplines : Spinning technology; Weaving technology; Chemical technology; Engineering; and Basic research. Work on two projects, viz. (i) Management attitude towards research vis-a-vis future research needs, and (ii) survey of testing and process control instruments developed by research associations, was completed under the purview of the coordination council for fibre-based laboratories.

The Association celebrated its silver jubilee in November 1974 and to mark the occasion, published eight monographs which deal with topics of practical importance to the industry and in which ATIRA has acquired considerable first-hand information. Another publication entitled 'World History of Textiles', brought out on the occasion, traces the major developments in textile manufacture and related areas over the last 7000 years.

An agreement with the General Organization for Industrialization of UAR for transfer of technical know-how for durable press finish of polyester/cotton fabrics was completed successfully with the expiry of the guarantee period. Commercial manufacture of improved mechanical slub catcher was started. The low-temperature catalyst for pigment printing, developed by ATIRA, was well received by the industry. Thirty-two mills have started using this catalyst and have been able to save power in the range of 60-80 kW/hr. The short bleaching process for polyester/cotton or polyester/viscose blends has been introduced successfully in six mills; the process reduces time (40-50%) and costs (25-30%), and eliminates the use of sodium chlorite for full whites.

In the project on low-twist spinning, semi-bulk spinning and weaving trials have been conducted. The end breakage rates of low-twist yarns in spinning and weaving have been found to be acceptable. Fabrics with low-twist yarn as warp and weft compare favourably with equivalent normal fabrics in almost all the properties. The limitation of low-spinning draft has been partly overcome as a result of work done in collaboration with a machinery manufacturer; drafts up to 20 are now possible.

Considerable progress has been made in the project aimed at increasing the speeds of plain looms. Techniques have been developed using indigenously available electronic components for the measurement of picking force, shuttle acceleration and loom vibration. Modified designs for the picking cam and shuttle box have been prepared. Other useful accessories to the loom developed and being evaluated are : a weft exhaust stop motion for plain looms, a tappet analyzer for checking the profile of shedding tappets, and an instrument to check the regularity of the shedding mechanism.

Five units for the recovery of waste heat from stenter exhaust have been working successfully in 4 mills; heat recovery of the order of 60% has been reported by the users. It has been found possible to use a single recovery tower for two or three stenters located side by side. A flash economizer unit for the recovery of heat from boiler blowdown has been designed.

Work on 'never dried' cotton has been completed under a project sponsored by the International Institute of Cotton. Under this project the mechanical and physio-chemical properties of cotton fibres have been studied at various stages of growth and after drying under selected controlled conditions. Experimental yarns have also been spun from the 'never dried' cotton.

Under the consultancy and technical services of ATIRA, 40 operational surveys were undertaken. One hundred and six major consultancy problems and 607 *ad hoc* problems were attended to.

Twenty-seven research papers were published and 5 research reports and 4 survey reports were brought out. Six patents were filed.

Technology Awareness Service

With a view to keeping entrepreneurs informed about the processes/products and technologies developed by CSIR laboratories, *Research and Industry* (the quarterly journal being issued by the Publications & Information Directorate of CSIR) has introduced, in cooperation with the Technology Utilization Division of CSIR Headquarters, a new section under the title 'Technology Awareness Service', commencing with the June 1975 issue of the journal. This service gives information about the CSIR technologies in production, technologies available for utilization, and technologies utilized and transferred. A sub-section 'News & Notes', relating to CSIR's R & D activities is also included.

Reprints (free) of 'Technology Awareness Service' pages can be obtained, on request, from the Technology Utilization Division, CSIR, Rafi Marg, New Delhi 110001.

Automotive Abstracts

The Automotive Research Association of India (ARAI), Poona, the newest cooperative research association to join the CSIR complex, has started publishing a monthly abstracting periodical (mimeographed) devoted to automotive research and industry. The first issue of the journal (August 1975) contains 14 abstracts of articles culled from different periodicals.

Readers interested in 'Automotive Abstracts' may write to : The Director, Automotive Research Association of India, Poona 411004.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Flooring Tiles from Asbestos Cement Factory Wastes

A number of factories in the country manufacturing asbestos cement are facing the problem of disposal of wastes like asbestos-cement sludge and recuperator waste. The Regional Research Laboratory (RRL), Jorhat, has studied this problem and has successfully developed a simple process to utilize these wastes for making floor tiles. A number of tiles have been made by the laboratory and tested according to IS:1237-1959. The results indicate that even at a low moulding pressure of 51 kg/cm^2, the values of transverse breaking load and water absorption (percentage) satisfy the specification requirements.

Tiles of different shapes—square, hexagonal, zigzag, non-skid—and of different sizes can be made by the RRL process.

The raw materials required are : waste asbestos-cement sludge and recuperator waste, etc.; ordinary cement; white cement; marble dust and chips; and pigment. All these are available indigenously.

The main equipment required are : pulverizer, ball mill, concrete mixers, hydraulic press with necessary moulds for tile-making, grinding machine, curing tanks and water storage tanks. All these are available indigenously.

The total capital outlay for setting up a plant, with a suggested capacity for making 2000 tiles ($20 \times 20 \times 2$ cm) per day (single shift of 8 hr), has been estimated at about Rs 2·00 lakh (comprising Rs 1·50 lakh as fixed capital and Rs 0·50 lakh as working capital). The cost of production is estimated at about 30-35 paise per tile. The approximate selling price would be about 95 paise per tile.

Further details can be had from : The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PATENTS ACCEPTED

Indian Pat. 133444

A process for manufacture of double sulphate of potassium and magnesium (potassium schoenite) from mixed salt obtained from sea bittern

G. T. Gadre, N. N. Udwadia, D. J. Mehta & R. M. Kawa

Central Salt & Marine Chemicals Research Institute, Bhavnagar

The principal potassium fertilizers of commerce are potassium chloride, potassium sulphate, potassium schoenite (double sulphate of potassium and magnesium) and potassium nitrate. All potassium fertilizers with the exception of potassium nitrate are imported into India. The requirement of potassium fertilizers in the Fifth Plan is about one million tonnes.

Sea bittern is a waste liquor of the salt industry and contains 2·0-2·5% potassium chloride. The liquor is evaporated to obtain the salt evaporite, known as mixed salt; its composition when it is collected under controlled conditions is potassium chloride 18-20%, magnesium sulphate 30-35%, sodium chloride 16-18% and magnesium chloride 4-6%. For every 100 tonnes of salt produced, 6 tonnes of mixed salt can be obtained.

A content of sodium chloride of more than 2% is not desirable in the potassium fertilizer. It must be separated before mixed salt is converted to potassium schoenite. The separation is achieved by means of a flotation technique developed at the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar. Flotation of potassium and magnesium salts from mixed salt is achieved by using flotation agents such as alkylamine, mainly octadecylamine acetate, and another reagent, viz. highly sulphonated castor oil. After the flotation of potassium and magnesium salts, a calculated quantity of water is added to convert the potassium chloride and magnesium sulphate to the double sulphate of potassium and magnesium.

The prices of potassium chloride and potassium sulphate imported into the country were ranging so far from Rs 400 to 500 per tonne. The economical unit developed at CSMCRI requires a minimum production of 10 tonnes of potassium schoenite per day. Based on this process, a plant has been commissioned in private sector at Tuticorin.

It is now possible to produce potassium fertilizers from salt works producing 50,000 tonnes and more of salt. Presently there are about 30 salt works in India each of which produces more than 50,000 tonnes of salt; some 10 units are producing more than 1,00,000 tonnes of salt each. Thus, the average salt production from the salt works will be about 20 lakh tonnes. Besides, some major salt works are coming up in the south. On the basis of 20 lakh tonnes of salt production from the major 30 salt works, about 1,20,000 tonnes of mixed salt could be obtained. From this, 50,000 tonnes of potassium schoenite could be produced. Considering the recent increase in the price of potassium schoenite containing 23-24% K_2O, the total value of potassium schoenite will thus be Rs 37 million. Hence, considerable foreign exchange could be saved if potassium schoenite manufacture is taken up by the major salt manufacturers in India at their salt works.

PATENTS FILED

589/Cal/75 : An improved system of roof truss, N. M. Raju, B. P. Verma, S. V. Ali & Bhagwant Singh—CMRS, Dhanbad.

678/Cal/75 : A new type of liquid crystal material for use in electro-optical display devices, V. G. Bhide, Subhash Chandra & S. C. Jain—NPL, New Delhi.

698/Cal/75 : Process for the manufacture of progesterone from diosgenin, C. K. Atal, P. Ramachandra Rao, K. L. Handa, S. K. Banerjee, B. D. Gupta, R. K. Dahdev & K. D. Sharma—RRL, Jammu-Tawi.

699/Cal/75 : Surface wave probe for ultrasonic non-destructive testing, V. N. Bindal & Vinod Gogia—NPL, New Delhi.

700/Cal/75 : A low-cost electronic thermometer for biomedical and other applications, Surinder Singh & Ram Parsad—NPL, New Delhi.

702/Cal/75 : A liquid crystal electro-optical device, V. G. Bhide, Subhash Chandra & S. C. Jain—NPL, New Delhi.

749/Cal/75 : Manufacture of potassium silicate by ion-exchange method, G. T. Gadre & U. K. Tipnis—CSMCRI, Bhavnagar.

PERSONNEL NEWS

Appointments

Dr Akhtar Husain

Dr Akhtar Husain has been appointed Scientist 'F' at the Central Indian Medicinal Plants Organization (CIMPO), Lucknow, with effect from 9 September 1975.

Born on 1 July 1928, Dr Akhtar Husain had his early schooling in his home district Basti (Uttar Pradesh), and obtained the master's degree (1954) in agriculture from the Government Agricultural College, Kanpur, with high academic honours.

Dr Akhtar Husain

Recipient of a research fellowship from the North Carolina State University (USA), he obtained doctorate degree in plant pathology in 1957; and was selected as the outstanding Ph.D. student of that university for the year 1957 and received 'Phi Kappa Phi' award. Dr Husain worked as Assistant Plant Pathologist in the Connecticut Agricultural Experimental Station, New Heaven (USA) for about a year, and made a notable contribution to the physiology of parasitism of Dutch Elm disease and Tomato Wilt. While at New Heaven, Dr Husain contributed, on invitation, a chapter in one of the volumes of 'Advanced Treatise on Plant Pathology', published by the Academic Press, New York.

After his return to India in January 1958, Dr Husain joined the Indian Council of Agricultural Research as Plant Pathologist at the Regional Research Centre (Oilseeds and Millets) at Kanpur, and became Head of the Centre in 1961. While at Kanpur, he made valuable contributions to the control of diseases of oilseeds and millets.

Dr Husain joined the Regional Research Laboratory, Jammu & Kashmir, in 1963. At this laboratory, he first worked as Head of the Division of Plant Protection and later organized the Discipline of Agricultural Sciences. One of the main contributions of Dr Husain and his team is the development of indigenous technology for artificial cultivation of ergot of rye (*Claviceps purpurea*) in India. As a result, ergot is being grown commercially at various farms of CIMPO in Jammu & Kashmir for the last six years and the country has become self-sufficient in this valuable drug, which was previously being imported from Europe. Dr Husain and his colleagues are also responsible for isolating a high alkaloid strain of ergot and the drug produced by this strain is considerably superior to ergot imported from Europe.

At RRL Jammu, Dr Husain was also Scientist-in-charge of Drug Farms & Factories (CIMPO) for more than three years. It was during this period that the Farms & Factories (CIMPO) achieved a breakthrough and the unit, which was undergoing heavy losses for more than 13 years, became a profit-making undertaking. As a result of R & D efforts carried out under Dr Husain's guidance, belladonna (*Atropa belladonna*) was introduced on a large scale on Kashmir Farms and the country became self-sufficient in this drug within three years. He was responsible for the introduction of hops as a commercial crop on CIMPO Farms and also started the first experiments on the cultivation of *Dioscorea deltoidea* on these farms.

While at Jammu, Dr Husain went to USSR as a Visiting Scientist in 1971 and studied the working of various research institutes concerned with medicinal plants as also drug farms in that country. He is author of more than 55 research papers.

Dr Husain is member of Indian Phytopathological Society, American Phytopathological Society and a Fellow of the National Academy of Sciences, and a recognized guide for Ph.D. degree of the Agra University and Aligarh Muslim University.

Dr M. K. Chakraborty

Dr Manindra Kumar Chakraborty has been appointed Scientist 'F' (Deputy Director), Central Mining Research Station (CMRS), Dhanbad, with effect from 15 September 1975.

Dr Chakraborty (born 1 February 1919) had a brilliant academic career. He obtained his B.Sc. (Hons) in 1940 and M.Sc. in 1941 from the University of Dacca and D.Phil. degree (in chemistry) in 1952 from the University of Calcutta. With a Technical Cooperation Mission Fellowship he visited different laboratories in USA and carried out advanced research on occupational health problems of miners, and industrial workers and on air pollution. At the invitation of DAAD (German Academic Exchange Services) he visited a number of laboratories in West Germany in 1971-72 to study the latest developments in the field of industrial hygiene and physiology.

Dr Chakraborty

Prior to joining CMRS in 1959 as Assistant Director, he was a Research Officer at the All India Institute of Hygiene and Public Health, Calcutta. At CMRS he has been in charge of the Health Laboratory and Coordinating Scientist of a number of laboratories of the Mine Safety Group.

Dr Chakraborty has carried out research for over 35 years and published 100 scientific papers. He has participated in several national and international conferences on industrial hygiene and air pollution.

He was the recipient of BEL-IND Award for the best paper in research in industrial health in 1968. He delivered Sir Ardeshir Dalal Memorial Lecture (1970) and P. P. Chowdhury Memorial Lecture (1967) organized by the Indian Association of Occupational Health. In 1972, he attended the regional seminar on Air Pollution organized by WHO. He also attended as an Indian delegate the International Congress on Pneumoconiosis held at Bucharest in 1971 under ILO auspices.

Dr Chakraborty is associated with a number of universities as examiner for post-graduate and doctorate examinations. He is an executive member of the Physiology Section of the Indian Science Congress Association for 1975.

Dr B. Singh

Dr Bhagwant Singh has been appointed Scientist 'F' (Deputy Director), Central Mining Research Station (CMRS), Dhanbad, with effect from 15 September 1975.

Dr Singh (born 10 July 1931) has been working at CMRS for the past 12 years as head of the Mine Technology Group. He spent about 10 years in Europe and received all his mining education in UK. Dr Singh has 16 years' research experience and has served the mining industry for about three years in India and abroad. He has more than 200 research papers to his credit and received the National Mineral Award for outstanding work in rock mechanics and strata control. Dr Singh is recipient of the Inventions Promotion Board's (NRDC's) award for design and development of two instruments, of British Ropes Ltd prize in mine planning from University of Sheffield, of President's medal of the Indian Mine Managers' Association, and of two silver medals and one bronze medal from the Mining, Geological and Metallurgical Institute of India.

Dr Singh

Dr Singh has to his credit 26 patents. Some of the instruments designed by him are under commercial production in India. At CMRS, he initiated and organized research on mine working and mining methods.

A number of new approaches relating to prediction of mine subsidence parameters, estimation of support density in longwall workings, use of equivalent materials and pillar workings, etc. have been evolved by him. Dr Singh is also advising a number of hydroelectric projects in connection with strata control aspects in tunnels.

NML Silver Jubilee

The National Metallurgical Laboratory (NML), Jamshedpur, will be celebrating its silver jubilee from 14 to 17 November 1975. During this period the laboratory will hold, in collaboration with the Indian Institute of Metals (IIM), the thirteenth National Metallurgists' Day and twenty-ninth Annual Technical Meeting of IIM. A symposium on Problems in Technology Transfer from R & D Laboratories to Industry will also be held. The symposium will cover the following aspects : Selection and programme of R & D projects; Monitoring of a project and evaluation of its progress; Methodology of transfer and utilization of technology; Problems involved in technology transfer; Role of consultants in the transfer of technology; and Role of scientists in the development of processes and products, their industrial evaluation and market survey, etc. Scientists, technologists, industrialists, entrepreneurs and other interested persons are invited to attend the silver jubilee function. Further particulars may be obtained from the Director, National Metallurgical Laboratory, Jamshedpur 831007, or the President, Indian Institute of Metals, Jamshedpur Chapter, C/o National Metallurgical Laboratory, Jamshedpur 831007.

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CSIR NEWS

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Research and Industry Get-together : CSMCRI

A get-together of scientists, industrialists and officials of the Gujarat Government was held on 27 September 1975 at the premises of the Gujarat Chamber of Commerce & Industry (GCCI), Ahmedabad. Organized under the joint auspices of the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, and GCCI, the get-together discussed the report prepared by CSMCRI on areas of R & D in the fifth five-year plan programmes of Gujarat State and industries under five major sectors, viz. chemical, engineering, biological, physical & earth sciences, and fibre science & technology.

Inaugurating the get-together, Shri Babubhai Jashbhai Patel, Chief Minister of Gujarat, called upon research scientists and industrialists to link up their efforts to ensure that the fruits of research reach the common man. Such an approach alone could fulfill the objective for the new social order of uplifting the common man—an objective which is a joint responsibility of the government, scientists and industrialists, he added. Shri Patel also enumerated the state's industrial resources like crude oil and minerals and expressed the hope that if all these are utilized fully, Gujarat would become the most advanced state in the country in the next few years.

In his address, Prof. Y. Nayudamma, Secretary to the Government of India and Director General of Scientific & Industrial Research, appealed to the government for a clear-cut directive to the research institutions. He further said that the government should fix priorities and direct scientists to give a specific answer to the problems faced by the state.

Shri Babubhai Jashbhai Patel, Chief Minister of Gujarat, inaugurating the get-together

Special invitee Shri Bhailalbhai Contractor, Minister of Industries, Government of Gujarat, reminded the scientists and the industrialists about the vast potentiality of the state. He said that the Gujarat Government would offer all facilities for exploring these potentialities for the maximum benefit.

Dr C. V. S. Ratnam, Managing Director, National Research Development Corporation of India, stressed the need for the propagation of the concept of horizontal transfer of technology whereby processes developed by an industrial unit were provided to other units.

Presiding over the inaugural session, Shri Indravadan Pranlal Shah, President of GCCI, said that the R & D facilities in the state were too meagre to sustain maximum industrial development. He suggested the setting up of a regional research laboratory.

While welcoming, Dr D. J. Mehta, Scientist-in-charge of CSMCRI, said that the government and industries were anxious to utilize the capabilities of CSIR. He suggested the strengthening of efforts for streamlining indigenous scientific capabilities to their beneficiaries.

The business session of the get-together was held under five different groups (sectors).

In the chemical sector, it was observed that there were no major problems so far as this sector was concerned. The problems referred to in the

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report (prepared by CSMCRI) and views obtained from the national laboratories were discussed. A note submitted by the Industries Department of the Gujarat Government was also discussed and clarifications were given by the scientists.

In the engineering sector, the need for setting up testing facilities and field stations in Gujarat was stressed. It was recommended that CSIR laboratories should bring out handouts on R & D capabilities from time to time.

The need for growing medicinal plants and essential oil bearing plants in the state was stressed in the session relating to the biological sector. This sector also recommended the development of slaughter house products, utilization of raw materials for the setting up of agro-industries, and development of fisheries and fish products, etc.

In the physical and earth sciences sector, recommendations were made for the exploitation of oceanic minerals and other resources, solar energy utilization, and manufacture of electronic goods.

In the fibre science and technology sector, the recommendations related to the production of synthetic fibres, such as polyesters, polyamides and acrylics, and inter-fibre comparison; study of processes to produce cottonseed protein for human consumption; increased yield of cotton; ginning of cotton; operational research on cost of cotton and other products in the textile industry.

In the concluding session, Prof. Nayudamma assured the industries and the government of the assistance of CSIR and its constituent laboratories.

Shri Indravadan Pranlal Shah announced the donation of a sum of Rs 10 lakh to CSIR by Hari Om Trust, the interest proceeds of which would be earmarked for signal research contribution made in a year for the benefit of society as a whole. He also announced a contribution of Rs 25,000 a year initially for five years from GCCI for setting up a polytechnology clinic proposed under the auspices of the government, industry and CSIR at Ahmedabad.

VITM's Anniversary Celebration

The Visvesvaraya Industrial & Technological Museum (VITM), Bangalore, celebrated the tenth anniversary of its opening as well as the 115th birth anniversary of Dr M. Visvesvaraya from 15 to 21 September 1975. The theme for the celebration was 'communication' and all the exhibitions and demonstrations held related to early and modern methods of communication.

The celebrations were inaugurated on 15 September by Shri Mohanlal Sukhadia, Governor of Karnataka, who in his address emphasized the urgent need to make the country self-reliant in scientific and technological fields. Shri Sukhadia stated that science museums had a great role to play in the spreading of scientific temperament among the youth and that it also helped in kindling their interest in science and technology. Shri R. Gundu Rao, Minister of State for Information and Youth Services, Government of Karnataka, presided over the inaugural function and Shri B. N. Gupta, Founder President of the Visvesvaraya Industrial Museum Society traced VITM's history.

Four CSIR Personnel Honoured by ISI

Prof. Dinesh Mohan, Director, Central Building Research Institute, Roorkee; Prof. G. S. Ramaswamy, Director, Structural Engineering Research Centre, Roorkee; Shri S. Parthasarathy, Scientist-in-charge, Insdoc, New Delhi; and Dr H. C. Visvesvaraya, Director,

Display of early telegraph instruments and telephones in the exhibition : VITM

Cement Research Institute of India are among the recipients of the Fellowship of the Indian Standards Institution (ISI). The Fellowships, conferred at the ISI convention held at Bhopal in October 1975, are in recognition of their valuable contributions to the promotion of standardization in their respective fields.

Dr Amla Appointed Director, CFTRI

Dr Bansi Lal Amla, Scientist-in-charge of the Central Food Technological Research Institute (CFTRI), Mysore, has been appointed Director of the institute. He took charge on 15 August 1975.

Dr Amla

Born on 1 January 1931, Dr Amla received his M.S. degree from the Cornell University (USA), and doctorate from the University of Massachusetts (USA), where he was Assistant Professor of Food Technology during 1959-60. Earlier he graduated from the Banaras Hindu University with a high first class.

On his return to India in 1961, Dr Amla worked with the Food Department, Ministry of Agriculture & Irrigation, as a Pool Officer for some time before joining a private organization concerned with cold storages and food-processing plants.

In 1964, Dr Amla joined CFTRI and was chairman of its Industrial Research, Consultancy and Extension Discipline and of Experiment Stations until August 1972. He was closely associated with research, planning and management of the institute since then, and played a key role in giving a new industrial orientation to the research programmes of the institute. He was responsible for reorganizing, extending and strengthening the industrial consultancy and technology transfer services of the institute so as to meet the ever increasing challenges posed by the problems of the industry as well as various organizations. Specialized facilities have been created to provide expert consultancy services by way of supplying model schemes, feasibility and project reports, pre-investment surveys, advice on the selection of machinery and specifications, and assistance in launching and executing projects.

Dr Amla was responsible for enlarging the scope of the Experiment Stations of the institute so as to provide assistance in handling, preservation and utilization of foodgrains, fruits and vegetables, meat, fish and such other products. He has been associated with the development of several important processes to an industrial scale.

Ever since he became Scientist-in-charge of the institute in August 1972, he has introduced imaginative management policies with regard to identification of projects, internal coordination, planning and programming, techno-economic evaluation of projects, and transfer of technology to industry. These measures have paved the way for better overall performance as regards research utilization and for a fruitful rapport with different sectors of industry. He has made special efforts to develop closer liasion with small-scale industries associations, chambers of commerce, agro-industries corporations and industries departments of various states.

Dr Amla has participated in a number of international conferences and symposia, and has served on several governmental and other scientific association committees and task forces. He is the chairman of the Working Group on Food Processing & Fruit Preservation Development Council for Food Industries. He also holds the membership of a number of professional societies including Sigma Xi (USA); Phi-Tau Sigma (USA); and of the Association of Food Scientists and Technologists, India.

Dr Amla is author/co-author of many technical papers and articles, and is the chief editor of two popular scientific journals issued by CFTRI.

NML's Technology Utilized for Production of Vanadium Metal

Vanadium metal has been produced for the first time in the country at the Mysore Iron and Steel Co. Ltd (MISL), Bhadravati, utilizing the know-how developed at the National Metallurgical Laboratory (NML), Jamshedpur. The project is based on the utilization of vanadiferous iron ores available near Masanikeri, about 40 miles from Bhadravati. About five tonnes of enriched vanadium slag have been produced using about 300 tonnes of vanadiferous ores mined by the Geological Survey of India from the Masanikeri area. The 1500 kVA electric furnace of the steel works was used for producing the enriched slag containing about 20% vanadium pentoxide. A high-grade pig iron with low phosphorus (0·04% max.) and silicon (0·2% max.) content was obtained as the principal byproduct.

Vanadium metal is of strategic importance and is used in the manufacture of a variety of ferro-alloys, low-steel alloys, high-speed steels, tool steels, and heavy-duty rails such as those used for carrying overhead cranes in steel works. Ferro-vanadium alloy is also used in armoured vehicles and other military equipment. By adding the required quantity of vanadium, the steel can be made to withstand thermal shocks and low temperatures. Vanadium pentoxide is an important catalyst in the production of sulphuric acid.

Aluminium Alloys for Heat Exchange Applications : Corrosion Studies by CECRI

In a project sponsored by the R & D Unit of Bharat Heavy Electricals Ltd, Bhopal, the Central Electrochemical Research Institute, Karaikudi, undertook a study of the corrosion behaviour of aluminium alloy tubes to be used in the fabrication of heat exchangers. Steam, transformer oil, air or hydrogen was to be used as heating fluid and water as the cooling fluid. The institute carried out studies on a test rig in which an experimental heat exchanger was installed. Corrosion was likely to take place only on the water side, and under the flow conditions the tubes were expected to last five years. It was found that the aluminium alloy tubes could be used with de-ionized water (fortified with inhibitor). The corrosion resistance of these alloys would suffer an adverse change in galvanic contact with brass or steel even in de-ionized water. This could be overcome only by using tube sheets of the same alloy if recirculation was desired; otherwise, the economics of using 'once-through' system of cooling had had to be examined.

The experiments were carried out under the same conditions under which the heat exchangers were to function in the plant. A detailed report of the study with recommendations was provided to the sponsor.

Drinking Water by Distillation of Saline Water through Solar Energy

Most parts of India receive about 500 cal/cm^2 of solar energy per day during a major part of the year. Also, the regions facing water shortages are rich both in saline water and solar energy. Therefore, the drinking water problem in these regions can be solved by devising techniques for utilizing solar energy for desalination of water.

Experimental and theoretical investigations on the distillation of saline water using solar energy, made available by glass-covered basin type stills, have been made by Shri S. D. Gomkale of the Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar. In the present investigations, ten stills of over 350 m^2 of total water area were used. Water was taken in simple concrete constructions. It was found that a brine depth of 10 cm and a glass cover angle of 20° are best suited for the concrete constructions. Experiments carried out, on laboratory scale, to increase the output using reflectors, anti-radiation structures and double glass covers showed that with reflectors the output increased by 30 to 40% but in the other two cases it decreased. Feeding of pre-heated brine (temperature higher than normal by 4 to 5°C) continuously to the still resulted in 3 to 5% higher output.

Solar stills designed by Shri Gomkale and installed at Navinar lighthouse are supplying 130 litres of drinking water per day.

While examining the economics of solar distillation it has been observed that for a plant of up to a few thousand litres per day capacity solar distillation is more economical than reverse osmosis and electrodialysis plants. The nature of heat and mass transfer operation taking place inside the still is transient. The output is mainly dependent on solar radiation intensity, although other atmospheric variables, viz. ambient air temperature and wind velocity, also have some effect on productivity.

Shri Gomkale was awarded the Ph.D. degree from the Nagpur University for his thesis based on these studies.

Conference Briefs

Dr P. K. Seth of the Industrial Toxicology Research Centre (ITRC), Lucknow, attended, on invitation, the Sixth International Congress of Pharmacology held at Helsinki (Finland) during 20-25 July 1975. Dr Seth also acted as chairman of a symposium on Toxicity and Metabolism of Plastics and Plasticizers held during the congress. Toxicogenic potential of phthalate plasticizers and plastics was discussed at the symposium. Presentation of research papers was followed by a general discussion at which Dr Seth and Dr Gary M. Booth (USA) acted as moderators.

It was observed that certain chemical additives could leach out from the finished polymer and contaminate the food, blood or other fluids, and pharmaceuticals stored in them. The leachability of di-2-ethylhexyl phthalate (DEHP), a most commonly used plasticizer, was reported to be directly linked to the lipophilic property of the solution. Significant quantities of this plasticizer have been detected in the tissues of patients who received blood stored in PVC bottles. Very small concentrations of the solubilized DEHP were reported to produce respiratory distress in rats. An electron microscopic study of the lungs of phthalate-treated rats suggested an inflammatory state, frequently referred to as 'shock' or 'wet' lung. Studies in a model ecosystem indicated that algae, snails, mosquito larvae and fish could concentrate DEHP in much larger concentrations than present in the surrounding water. These results suggest that this plasticizer closely resembles DDT in rate of uptake and storage and it partitions strongly in the lipids of plants and animals and is concentrated throughout the food chains.

At the symposium Dr Seth reported the research work being carried out at ITRC on the biochemical and pharmacological effects of DEHP. The results suggest that DEHP affects the energy-linked reactions of rat gonads which may perhaps be responsible for the reported reproductive dysfunction due to plasticizers in animals and that it can alter the duration of action of pentabarbitone, a therapeutic drug. The direct toxicogenic potential of DEHP and the possibility of its interaction with xenobiotics point to a new health hazard.

Dr Seth also participated in the symposia on Evaluation of Toxicity of Food Additives, and Drug Metabolism organized by the congress.

* * *

Dr R. L. Datta of the Central Salt & Marine Chemicals Research Institute, Bhavnagar, participated in the International Solar Energy Congress at Los Angeles, USA, as Vice President of the International Solar Energy Society, which organized the congress from 28 July to 2 August 1975, with the cooperation of the University of California (Los Angeles) and the US Government. The formulation of proposals to use the existing solar gadgets immediately for solar heating and cooling, and conversion of solar energy directly to power on smaller scale immediately and on larger scale in the near future was the highlight of the congress. Six scientists from India, including Dr Datta, presented papers on topics relevant to India and spoke on the country's plan of action on solar energy applications. In the meeting of the Board of Directors of the International Solar Energy Society (ISES), broad outlines for the 1977 International Congress to be held in India were discussed. Dr Datta has been appointed member of the executive and finance committee and of the publications committee of ISES, and convener of the Committee of the International Solar Energy Congress.

A well-organized exhibition of solar-gadgets was also arranged on the occasion of the congress.

Taxonomy of Indian Mosses

This is the tenth in the series of botanical monographs published by the Publications & Information Directorate, New Delhi.

Compiled by Prof. R. S. Chopra (formerly of the Department of Botany, Panjab University, Chandigarh), this monograph provides an authentic taxonomic account of all classes and genera of mosses found in India and the neighbouring countries. In all, 2000 species belonging to 329 genera of 56 families have been covered. Keys for identification have been provided for all taxa up to the species level. The publication (pp. xxvi + 631, royal 8vo), is profusely illustrated.

Copies of the monograph are available from : The Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012.

Matsya aur Matsyiki

This volume, issued as a supplement to *Bharat ki Sampada* : *Prakritik Padarath* (Hindi version of the encyclopaedic publication The Wealth of India : Raw Materials) has been brought out recently by the Publications & Information Directorate, New Delhi. This volume is the Hindi version of the Fish & Fisheries supplement of The Wealth of India and deals with the various kinds of marine and inland fishes found in India and gives an account of various techniques of fisheries used in this country. The main sections of the supplement are : Elasmobranchs, Teleosts, Molluscs, Coastal Fisheries, Off-shore and Deep Sea Fisheries, Estuarine and Freshwater Fisheries, Fisheries in States, Fishing Craft and Gear, Preservation and Processing, Composition and Uses, and Marketing and Trade.

The statistical information has been updated. The 165-page (demy 4to) publication is profusely illustrated and contains a bibliography and an index, and will be useful to research workers, students and those concerned with fisheries in India.

Copies of the supplement are available from : The Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012.

Progress Reports

SERC Annual Report : 1974-75

The annual report of the Structural Engineering Research Centre (SERC), Roorkee/Madras, for 1974-75 has been brought out recently. The report (royal 8vo, 62 pages) shows that the research activities of the centre have been closely geared to the developmental needs of the country and most of the research projects in progress have also been identified by the National Committee on Science & Technology as priority areas where major thrusts have to be made.

At Roorkee centre, high priority was assigned to the development of ferrocement bins of 1- and 2-tonne capacities for storage of grains in rural areas. A survey was conducted in 29 villages covering four development blocks in Roorkee sub-division to assess the adequacy of current storage practices and to elicit the reaction of farmers to the use of ferrocement bins developed by SERC. The feedback from the survey will be utilized in reviewing the design and bringing the bins within the reach of most of the village farmers.

A draft code of practice for structural concrete was developed at the instance of the Indian Standards Institution to replace the current code. The draft was discussed at the meetings of the ISI Panel for Revision of Concrete Codes. Some modifications suggested by the panel were receiving attention at the centre. Simultaneously, work on the preparation of a design handbook was under way to assist the users of the code.

The field survey carried out earlier on Yamuna bridge at Agra to assess the intensity and frequency of live loads was repeated to study seasonal variations of traffic. The maximum bending moment developed in the bridge was found to be of the same order as that obtained during the first survey, i.e. 40% of the design bending moment. The percentages of different types of vehicles as well as the total tonnage of vehicles plying on the bridge were also recorded in these surveys. The data collected will be of considerable value in revising the loading standards and the design of partially prestressed concrete bridges.

The methodology for assessment of live loads in high-rise buildings was finalized and a loading platform was fabricated. A computer programme was developed to handle the dynamic analysis of multi-storeyed frames, considering the joint rotation, axial and shear deformations in columns and beams.

Experimental investigations on bin loads for evolving safe design of grain silos were continued. Tests on the silo with paddy as filling material were carried out and the data obtained were being processed. A pressure scheme for paddy silos will be recommended on the basis of test results. The draft Indian codes on silos for storing granular and powdery materials were approved by ISI.

At Madras centre, considerable progress was made on the project on prefabrication. A survey of the design procedures currently being used in prefabricated construction was completed and twelve technical reports were prepared covering the various aspects of analysis and design of large-panel prefabricated buildings. A skeleton prefabricated system suitable for multistoreyed buildings was developed. A large-panel prefabrication system using concrete panels for walls and floors was also developed including typical structural design. This system is suitable for residential flats for the low-income group.

The preliminaries for the work on the pace-setting project on large-panel prefabrication at Besant Nagar, Madras, for the construction of 144 flats were completed by the Tamil Nadu Housing Board under this centre's direction. All the six blocks (144 flats) were built up to the plinth level.

A report containing the recommendations and designs evolved by the centre for the structural use of cellular concrete in floors and roofs was prepared and submitted to the Tamil Nadu Housing Board at whose instance the work was undertaken.

A technique was developed for the production of partially prestressed electricity poles, especially for rural electrification, using portable/disposable moulds. Economics of manufacture and use of such poles in rural electrification was also worked out. About 4 million poles are required for rural electrification in the country during the Fifth Plan period.

A computer programme was developed for the automated optimum design of back-up structures of parabolic dish antennas for the Indian Space Research Organization. Sophisticated computer software was also developed for the analysis of a variety of complex structures with IBM 370/155 system.

Two project reports, one on funicular shell flooring and roofing elements developed by the centre and the other on prestressed concrete in electric transmission line poles, were prepared for incorporation in the CSIR's industrialization plan for Karimnagar.

A patent relating to a process for the manufacture of prestressed concrete poles using high-strength deformed bars and portable/disposable stressing beds was filed. Forty-one research papers were published.

The total financial inputs during the year amounted to about Rs 5·021 million.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Fungal Acid Protease

Fungal acid protease (FAP) can be used for a number of purposes, especially as an acid bating agent in leather manufacture and as an aid to gastric digestion of proteins in patients suffering from dyspepsia. It can also be used for the preparation of protein hydrolysates used in animal and human nutrition and as nutrient media for microorganisms.

The Indian Institute of Experimental Medicine (IIEM), Calcutta, has developed a process for the production of fungal acid protease. Since the enzyme product is active in low pH range for pickle bath, it can be used both for bating and pickling as one step, thereby saving time, labour and electricity.

The process developed by IIEM consists in growing the fungus on a solid medium made up of bran, acid and water spread out on enamel dishes, and incubating for a certain period at a certain temperature. The whole culture is dried and ground to powder. The powder is used as a bating agent in leather manufacture.

For further use as a digestive aid and for the preparation of protein hydrolysates, the enzyme is purified as follows. The old solidified fungus is extracted with acidified water and the filtrate is subjected to fractionation with some salt. The enzyme acid protease precipitated in some fractions of salt solution is collected by centrifugation and dried. The enzyme activity depends mainly on the conditions of time and temperature.

About 400 tonnes of bating agent are consumed annually in the country. The amount of consumption of pepsin and pancreatin comes to 7 tonnes and 90 tonnes each. For various proteolytic uses, including the medicinal use as digestive, it is estimated that digestive preparations worth about Rs 300 million are sold in India annually. A small amount of bating enzyme is being produced in the country, and the rest is being imported. There is no indigenous production of pepsin and pancreatin. Very recently, a firm has started producing an enzyme having acid protease activity, but the product is less active and less stable at low pH. The price of imported bating agent is Rs 5 per kg and that of pepsin is Rs 80 per kg.

The IIEM process has been studied for a period of 6 months on a pilot plant capable of producing 10 kg of active product or 40 kg of diluted product per day. The final product has been found to be four times more active than the imported bating agent Oropone, and the partially purified product compares favourably with pepsin (USP) with regard to proteolytic effect on haemoglobin.

The items of plant and machinery required are : kneader, enamel dishes, autoclave, boiler, air cooler, trolleys, drying oven, grinder and power line (440V). All these can be made indigenously.

The main raw materials required are wheat bran or rice bran and some acid, and these are readily available indigenously.

The optimum capacity of an economically viable unit is 24 tonnes of acid protease per annum (300 working days) or 80 kg per day of two shifts. The estimated capital investment for such a unit has been estimated at Rs 1·10 lakh (comprising Rs 80,000 on plant and machinery, and Rs 30,000 as working capital.

Further details can be had from : The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Radio Frequency Generator

The radio frequency (RF) generator is a device for generating high-frequency electrical waves which when connected to the probe of ultrasonic therapy produces ultrasonic waves. Ultrasonic waves find applications in engineering, biology and medicine; they can also be used for atomization of low-viscosity liquids and for the production of aerosols when used in conjunction with appropriate probes.

RF generators using transmitting tubes of required power and frequency rating are well known. The dc power required for these generators is usually obtained from rectifier valves. Generators which can supply high stability RF waves for a predetermined time are not readily available.

The Regional Research Laboratory (RRL), Bhubaneswar, has developed an RF generator. The generator is specially designed for ultrasonic therapeutical applications for curing ulcers, arthritis, sinusitis, etc. It is free from the drawbacks of the conventional devices. In the RRL device, rectifier valves are replaced by rectifier diodes for the production of dc power. This arrangement economizes power consumption and space required. Frequency stability has been achieved by the use of electron-coupled Hartley oscillators. A suitable electronic timer has also been incorporated to get the RF energy for required periods.

The specifications of radio frequency generator developed by RRL, Bhubaneswar, are as follows :

Voltage supply : 230 V, 50 Hz
Frequency of output : 500-1000 kHz
RF output : 21 W
Total power consumption : 45 W
Dimensions : 40 × 30 × 25cm
Weight : 8 kg

Rectifier diodes, oscillator valve, resistance, condensors, transformer, timer and panel meter are the essential components needed, and all these are available indigenously.

The major equipment required are RLC bridge, RF signal generator, vacuum tube voltmeter, oscilloscope, frequency counter, RF power meter, standard signal generator, coil winding machine and AVO meter. All these are available indigenously.

The total investment for setting up a plant capable of producing 600 RF generators per annum has been estimated at Rs 8·86 lakh. The cost of production has been worked out to be Rs 1700 per piece.

Further details can be had from : The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PATENTS FILED

1121/Cal/75 : Improvements in or relating to development of active material for pocket type and pressed mass type nickel cadmium cells (negative active material), H. V. K. Udupa, P. V. V. Rao, R. Sabapathi, V. Chidambaram & K. Balakrishnan—CECRI, Karaikudi.

1433/Cal/75 : Improvements in or relating to the manufacture of lead zirconate titanate, V. N. Bindal, T. R. K. Menon & N. N. Swami—NPL, New Delhi.

1550/Cal/75 : A process for the synthesis of aryloxyalkylamines with hypotensive alpha adrenoceptor blocking and anti-inflammatory properties, S.K. Agarwal, P. C. Jain, Nitya Nand, R.C. Srimal & B. N. Dhawan—CDRI, Lucknow.

1551/Cal/75 : A process for the synthesis of antifilarial 1-substituted 4-carbamoylpiperazines, Satyavan Sharma, R. N. Iyer, Nitya Nand, R. K. Chatterjee, S. Chandra, A. Dutta & A. B. Sen—CDRI, Lucknow.

117/Cal/75 : A process for the synthesis of 3-substituted 4-oxo-5H-pyridazino (4,5-b) indoles as tubal occluding agents, A. C. Venkateswar, S. N. Rastogi, N. Anand, B. Malviya, (Miss) N. K. Sud, H. Chandra & A. B. Kar—CDRI, Lucknow.

118/Cal/75 : Fermentation process for the production of calcium gluconate, C. L. Chopra, G. N. Qazi, C. N. Gaind & C. K. Atal--RRL, Jammu-Tawi.

169/Cal/75 : A new process for making low-iron aluminium sulphate and pure sodium or potassium silicate solutions from clay, M. C. Das & S. N. Dutta—RRL, Jorhat.

418/Cal/75 : Improvements in or relating to a process for the preparation of 2:4-xylenol, C.S.B. Nair, M. P. Sharma, S. K. Roy, K. C. Bit, K. K. Tiwari, O. K. Guha & G. S. Murthy—CFRI, Dhanbad.

420/Cal/75 : Improvements in or relating to a process for the production of N-1-naphthylphthalamic acid, suitable for use as a pre-emergence herbicide, A. K. Banerjee, P. K. Sanyal & B. K. Mazumdar—CFRI, Dhanbad.

422/Cal/75 : Improvements in or relating to dry batteries, H.V.K. Udupa, M. G. Potdar, R. Nagasethusubramanian & V. Balaramachandran—CECRI, Karaikudi.

423/Cal/75 : Development of a process for the manufacture of microphonic carbon granules, P. K. Jena, B. C. Mohanty & B. C. Swain—RRL, Bhubaneswar.

465/Cal/75 : Improvements in or relating to acid pickling of ferrous items, K. S. Rajagopalan, R. Srinivasan, N. Krithivasan, C. Rajagopal, (Miss) M. Sethukumari, (Miss) M. E. K. Janaki & P. S. Mohan—CECRI, Karaikudi.

511/Cal/75 : A process for the preparation of cholesterol from buffalo and goat spinal cord, V. C. Pandey, V. K. M. Rao & C. R. Krishna Murti—CDRI, Lucknow.

577/Cal/75 : Control system to monitor 4-nitro-2-chlorodiazonium chloride during coupling of β-naphthol, H.N.R.V. Rao, K. S. Udupa, Y. I. M. Iyer & S. Krishnamurthi—CECRI, Karaikudi.

578/Cal/75 : A sensor and control system for the diazotization of 4-nitro-2-chloroaniline, H. N. R. V. Rao, K. S. Udupa, Y. I. M. Iyer & S. Krishnamurthi—CECRI, Karaikudi.

580/Cal/75 : X-Band circular waveguide E-H-tuner, A. K. Jain (CSIR Research Fellow)—Department of Physics, Delhi University, Delhi.

590/Cal/75 : Improvements in or relating to the process for the surface preparation of mandrels for electroforming articles, B. A. Shenoi & S. John—CECRI, Karaikudi.

634/Cal/75 : A process for the preparation of solid ammonium persulphate, M. G. Potdar, R. Srinivasan & H. V. K. Udupa—CECRI, Karaikudi.

Workshop-cum-Training Programme on Project Management

The Council of Scientific & Industrial Research is organizing a Workshop-cum-Training Programme on Project Management from 15 to 26 December 1975 at the National Institute of Oceanography, Panaji, Goa. Participants will be drawn from among the scientists in national laboratories engaged in planning and management of R & D projects. The main objectives of the programme are : (1) to highlight the need and method of correlating R & D efforts with socio-economic goals of the nation; (2) to develop professional attitude and skills in the application of the tools of planning and management of R & D; and (3) to evolve a common attitude and understanding among the laboratory sub-systems for efficient implementation of R & D programmes.

The programme will cover : (1) National goals and science policy; planning theories and delineation of disciplines like economics, statistics, OR, management sciences, and management accountancy; and technological forecasting and technology assessment; (2) Optimum utilization of R & D potential in the laboratory—R & D management at laboratory level; objectives formulation, project selection criteria, resource allocation, coordination and control; and behavioural aspects of laboratory management; and (3) Efficient planning and evaluation of research projects—project management; initiation, programming and monitoring; and behavioural aspects of project management.

Further particulars can be had from Programme Directors Shri P. N. Chowdhury and Shri P. S. Nagpal, Planning Group, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 11/75

It is proposed to appoint two Scientists 'F' (Deputy Directors) at the Central Fuel Research Institute, Digwadih, Dhanbad.

Job Requirements

For Post 1 : The appointee will be required to plan/guide/coordinate laboratory and development work in the area of surface chemistry and catalysis, particularly applied to coal, coke and coal conversion.

For Post 2 : The appointee will be required to plan/guide/coordinate laboratory and development work in the area of coal beneficiation, coal science and systematics.

The appointees will be responsible for the overall programme formulation and evaluation of progress of work, besides active participation and should be able to work with teams of other qualified scientists. They will also assist the Director in the general organization of scientific work as and when required.

The selected candidates should be able to command the confidence of all researchers in their respective fields and the industry concerned and be able administrators and image builders to the institute.

Qualifications

For Post 1 : High academic qualifications with at least fifteen years' research and development experience in the field of heterogeneous catalysis and surface chemistry, particularly applied to studies on coal/lignite and products therefrom, with evidence of significant research publications in the subjects.

Experience in the use of modern instrumental techniques for studies on catalysts and solid supports will be considered as additional qualification.

For Post 2 : High academic qualifications with at least fifteen years' research and development experience in the field of coal beneficiation and/or coal science and systematics with evidence of significant research publications in the subjects.

Experience with industrial units on coal beneficiation and with use of modern instrumental techniques for studies on coal science will be considered as additional qualifications in the respective subjects.

Salary/Conditions of Service

The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merit. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proforma must reach this office on or before 8 December 1975.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

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Shanti Swarup Bhatnagar Prizes Presented

The Shanti Swarup Bhatnagar Prizes for the years 1970, 1972 and 1973 were presented to eighteen distinguished scientists at a function held at Vigyan Bhavan on 27 October 1975 by Shrimati Indira Gandhi, Prime Minister, and President of CSIR.

Speaking on the occasion the Prime Minister said that the Government was trying to bring about changes in scientific research policies, focussing attention on areas of national priority, and to make the researches relevant to the immediate needs of the people. She admitted that the Government had also been remiss in not funding research in priority areas. She said that many scientists worked only on fashionable and prestigious problems and looked up to foreign sponsored research programmes, which were naturally geared to the priorities of the sponsors and not to the national priorities. Consequently the scientific talent of our country was serving the purpose of others. She stated this should be rectified and that she had directed that sufficient funds should be made available to the research institutions and universities for research in areas relevant to the needs of the country.

Shrimati Gandhi agreed that research in some frontier areas like nuclear energy, space and electronics was necessary but equally important was the research to help the ordinary man.

Some of the priority areas identified by the Prime Minister are solar energy utilization, innovations in pumping water, improving lift irrigation systems, eradication of communicable diseases, research in family planning, and pollution control. Even improvements in the bullock-cart, which (in India) carries more goods than all railway and transport systems put together, would help the common man to a large extent.

Shrimati Indira Gandhi, Prime Minister, speaking on the occasion of the Shanti Swarup Bhatnagar Prizes presentation ceremony. Others seated on the dias are Prof. Y. Nayudamma, Shri P. N. Haksar and Shri K. G. Krishnamurthi.

Shrimati Gandhi felt that despite much superstition scientific temper was spreading in the country, though slowly. She also underlined the need to popularize science in the sense of educating the people about science.

Shri P. N. Haksar, Deputy Chairman, Planning Commission and Vice-President of CSIR, in his welcome address appealed to the scientists to abandon egocentrism, and work together.

Prof. Y. Nayudamma, Director General of Scientific & Industrial Research, in his address said that the health of science in the country was very good.

The Director General read out the citations which are reproduced below (three of the awardees—Prof. G. Swarup, Prof. K. Naha and Prof. S. C. Seshadri—were not present on the occasion).

Citations

Dr M. K. Vainu Bappu

The Shanti Swarup Bhatnagar Prize for Physical Sciences for the year 1970 has been given to Dr M. K. Vainu Bappu, Director, Indian Institute of Astrophysics, Kodaikanal, for his outstanding contributions in the field of astrophysics.

In collaboration with Wilson, Dr Vainu Bappu showed that there is a unique relationship between the width of the ionized calcium K-emission line and the absolute luminosity of a star. More recently, he has made significant contributions towards a proper understanding of this phenomenon, which has now come to be known as the Wilson-Bappu effect. Other noteworthy results he has obtained relate to the behaviour of sodium emission in comets near perihelion passage as influenced by solar wind effects and the nature and growth of magnetic fields associated with the appearance of sunspots in the active regions of the sun.

Prof. B. B. Biswas

The Shanti Swarup Bhatnagar Prize for Biological Sciences for the year 1972 has been given to Prof. B. B. Biswas, Bose Institute, Calcutta, jointly with Prof. S. C. Maheshwari, Professor of Botany, University of Delhi, Delhi.

Prof. Biswas has contributed significantly to the studies of regulation of RNA and protein synthesis in the cell, particularly the plant cell, and also to the understanding of the metabolic cycle during the formation and germination of seeds. The studies have opened up new vistas in the field of transcription process in higher organisms as well as in the regulation of some of the enzyme functions in relation to biosynthesis of inositol phosphates.

Prof. S. C. Maheshwari

The Shanti Swarup Bhatnagar Prize for Biological Sciences for 1972 has been given to Prof. S. C. Maheshwari, Professor of Botany, Delhi University, jointly with Prof. B. B. Biswas, Bose Institute, Calcutta.

Prof. Maheshwari has made significant contributions in the area of plant and cell physiology, particularly in the physiology and biochemistry of growth and differentiation in plants. His researches have revealed a new group of growth hormones, the cytokinins.

Prof. Maheshwari and his group have recently discovered the technique of raising haploid plants by anther culture. The development of haploids by the anther and pollen culture technique makes possible the establishment of homozygous lines in plants.

Dr A. P. B. Sinha

The Shanti Swarup Bhatnagar Prize for Chemical Sciences for the year 1972 has been given to Dr A. P. B. Sinha, Scientist, National Chemical Laboratory, Poona, jointly with Dr S. V. Kessar of the Panjab University, Chandigarh.

Dr Sinha's outstanding contribution lies in the field of solid state chemistry. He has made extensive studies on the synthesis of new manganites and their structural, electrical and magnetic properties. He has developed theories for thermoelectrical power and mobility in such semiconductors. His studies on electron lattice interaction have furnished a new basis for the theory of ferro-electricity. In his studies on thin film of heterojunctions, Dr Sinha has discovered interesting properties which throw new light on the mechanism of conduction in semiconductors. The products developed by him have found practical application in the electronics industry.

Dr S. V. Kessar

The Shanti Swarup Bhatnagar Prize for Chemical Sciences for the year 1972 has been given to Dr S. V. Kessar of the Department of Chemistry, Panjab University, Chandigarh, jointly with Dr A. P. B. Sinha, Scientist, National Chemical Laboratory, Poona.

Dr Kessar has made outstanding contributions in the field of steroidal and heterocyclic chemistry. He has been able to build the whole infrastructure of some *Solanum* alkaloids through a single operation. A number of first total syntheses have been accomplished by him in the field of azasteroids using an elegant and original pathway.

He has also developed a novel method of linking aromatic rings based on an intramolecular reaction between the benzyne and aromatic rings and has then effected the direct cyclization of haloanils of known unfavourable geometry. This synthetic route has been used by him for the synthesis of the phenanthridine ring system and several new heterocyclic systems. Using the same cyclization principle, but with phenoxide activation, he accomplished the synthesis of aporphine and related alkaloids.

Dr R. P. Wadhwa

The Shanti Swarup Bhatnagar Prize for the year 1972 in Engineering Sciences has been given to Dr R. P. Wadhwa, Deputy General Manager, Electron Tube Division, Bharat Electronics Ltd, Bangalore, jointly with Dr Govinda Swarup, Professor in Radio Astronomy, Tata Institute of Fundamental Research, Bombay.

Dr Wadhwa has guided the Division's research and development activities in such areas as indicator, X-ray, TV and transmitting tubes. The commercialization of these products has led to a doubling of the Division's production.

Earlier, he contributed to the design of crossed-field devices and helped the indigenization of production of components in such diverse fields as delay lines, pulse transformers, transistor circuits, interaction magnetron injection guns, beam plasma and crossed-field interaction. His work has helped achieve self-reliance through technical competence in areas of sophisticated technology.

Prof. A. S. Gupta

The Shanti Swarup Bhatnagar Prize for Mathematical Sciences for the year 1972 has been given to Prof. A. S. Gupta, Professor, Department of Mathematics, Indian Institute of Technology, Kharagpur, jointly with Dr C. S. Seshadri, Professor of Mathematics, Tata Institute of Fundamental Research, Bombay.

Prof. Gupta's significant contribution is in the field of fluid dynamics and magneto-hydrodynamics.

His work on heat transfer in free convection flow in the presence of magnetic field is noteworthy. His work on the stability of a layer of electrically conducting liquid rotating in the presence of a uniform magnetic field oriented parallel to the axis of rotation is important as it discusses the finite amplitude disturbances.

Prof. S. Chandrasekhar

The Shanti Swarup Bhatnagar Prize for the year 1972 in Physical Sciences has been given to Prof. S. Chandrasekhar of the Raman Research Institute, Bangalore, jointly with Dr S. K. Joshi, Head of Physics Department, Roorkee University.

Prof. Chandrasekhar's outstanding contribution lies in the field of crystallography, especially in the field of liquid crystals. He has proposed a new type of quadratic formula for the optical rotatory dispersion of crystals which proved to be a great improvement over a formula that had been in vogue. He has proposed and developed a method of estimating extinction effects experimentally in crystal analysis by the use of polarized X-rays.

Prof. S. K. Joshi

The Shanti Swarup Bhatnagar Prize for the year 1972 in Physical Sciences has been given to Prof. S. K. Joshi, Professor & Head of Physics Department, Roorkee University, Roorkee, jointly with Prof. S. Chandrasekhar, Raman Research Institute, Bangalore.

Prof. Joshi's contribution lies in the area of electronic states in disordered systems, electron correlation in narrow band solids and the related problem of Mott transition. He has proposed a number of models in the study of disordered materials and these models have been used to study the spectral functions and density of states for electrons in a number of binary alloys. He has also studied the problems of electrons in liquid metals and in amorphous semiconductors. He has studied excitation and ionization processes in atoms, ions and molecules due to the impact of charged projectiles such as electrons and protons. The study of these collision processes is of interest in plasma confinement, in astrophysical problems and in the study of upper atmosphere.

Prof. S. S. Guraya

The Shanti Swarup Bhatnagar Prize for Biological Sciences for the year 1973 has been given to Prof. S. S. Guraya, Head, Department of Zoology, Punjab Agricultural University, Ludhiana, jointly with Dr B. R. Murty, Director, Nuclear Research Laboratory, Indian Agricultural Research Institute, New Delhi.

Prof. Guraya's outstanding work lies in the field of cell biology and reproduction. His contribution in histology and ultra-structural studies of the mammalian ovary have thrown significant light on folliculogenesis and steroidogenesis. His research on follicular atresia has brought out the building up of interstitial tissue and the latter's part in hormone formation.

Dr B. R. Murty

The Shanti Swarup Bhatnagar Prize for Biological Sciences for the year 1973 has been given to Dr B. R. Murty, Director, Nuclear Research Laboratory, Indian Agricultural Research Institute, New Delhi. He shares the prize jointly with Prof. S. S. Guraya, Department of Zoology, Punjab Agricultural University, Ludhiana.

Dr B. R. Murty is an outstanding biometrical geneticist who has developed a new school of thought utilizing multivariate analysis for assessment of genetical divergence of crops with different breeding systems. His basic approach to the selection of developmental traits in both self- and cross-pollinated crops has helped considerably in the improvement of grain quality, disease resistance and productivity of agricultural crops.

Dr H. B. Mathur

The Shanti Swarup Bhatnagar Prize for Chemical Sciences for the year 1973 has been given to Dr H. B. Mathur, Scientist, National Chemical Laboratory, Poona, jointly with Prof. M. V. George of the Indian Institute of Technology, Kanpur.

Dr H. B. Mathur has made significant contributions in the study of beta and gamma spectroscopic properties of radioactive isotopes in the closed shell region. Using Mössbauer spectrometer technique he has studied structures of various molecules. His more recent contributions are in the fields of thermodynamics of complex ions in solution as well as the kinetics of high-temperature oxidation of metals, and in the studies on solid state diffusion in metals.

Prof. M. V. George

The Shanti Swarup Bhatnagar Prize for Chemical Sciences for the year 1973 has been given to Prof. M. V. George, Department of Chemistry, Indian Institute of Technology, Kanpur, jointly with Dr H. B. Mathur, Scientist, National Chemical Laboratory, Poona.

Prof. George has made significant contribution in several areas of organic chemistry. Among these may be listed the mechanism of organic reactions in general and their use as effective synthetic tools. His work in the field of organo-metallic chemistry can be considered classical. He has used these techniques in the synthesis of several interesting hetero-systems. His work in the photochemistry of various hetero-aromatic systems such as sydnones and xanthanates, and photochemical cyclo-additions has attracted considerable attention and is marked by original approach.

Prof. M. M. Sharma

The Shanti Swarup Bhatnagar Prize for Engineering Sciences for the year 1973 has been given to Prof. M. M. Sharma, University Department of Chemical Technology, Bombay, for his outstanding contribution in the field of Chemical Engineering.

Prof. Sharma's researches over the years have been of industrial importance and concerned with chemical reactions and mass transfer characteristics of fluid-fluid contactors. He has carried out a detailed study of the kinetics of gas-liquid and liquid-liquid reactions where the mass transfer is accompanied by chemical reaction, viz. oxidation of cuprous chloride, dithionite and aldehydes; absorption of isobutylene in aqueous sulphuric acid; alkylation of phenols with isobutylene; and reactions between carbon disulphide and aqueous amines, cyclohexanone and hydroxylamine sulphate. All these reactions are of industrial relevance. A simple method of studying the kinetics of fast reactions has also been devised by him.

Prof. Virendra Singh

The Shanti Swarup Bhatnagar Prize for Physical Sciences for the year 1973 has been given to Prof. Virendra Singh, Professor of Theoretical Physics, Tata Institute of Fundamental Research, Bombay.

Prof. Virendra Singh has made significant contribution to the various theories concerned with particle physics, particularly in the formulation of the analytic S-matrix theory, the elucidation of exact results from such formulations, and to the symmetry theories of hadrons and the use of such concepts for calculations on scattering amplitudes. These theories and calculations have thrown light on the recent experimental data on high-energy total cross-sections in hadronic processes.

Prof. Govinda Swarup*

The Shanti Swarup Bhatnagar Prize for the year 1972 in Engineering Sciences has been given to Prof. Govinda Swarup, Professor in Radio Astronomy, Tata Institute of Fundamental Research, Bombay, jointly with Dr R.P. Wadhwa, Deputy General Manager, Electron Tube Division, Bharat Electronics Ltd, Bangalore.

Prof. Swarup guided and supervized the establishment of the Ooty Radio Telescope right from the basic concept to the detailed design and fabrication. The construction in all its aspects, i.e. mechanical, structural, microwave and electronics, is entirely indigenous. The technological spin-off of this work has been considerable in the development of microwave antennas in India. Prof. Swarup has also investigated solar emission, pulsars and lunar occultation.

Dr K. Naha*

The Shanti Swarup Bhatnagar Prize for the year 1972 in Earth Sciences has been given to Dr K. Naha, Professor of Geology, Indian Institute of Technology, Kharagpur.

Dr Naha has made extensive contributions in structural geology and pre-Cambrian geology, especially in Rajasthan and in the Simla Himalayas. By combining the tectonic methods developed in the Eastern and Western Alps, an integrated geological history of the pre-Cambrian rocks of the Ghatsila area (Bihar) has been traced. Dr Naha's work on some of the oldest rocks in the Rajasthan pre-Cambrians has led to a revision of the structures and stratigraphy of Aravalli-Railo rocks and the Banded Gneissic complex. He has worked out methods of elucidating large-scale structures of migmatites. Geometry and kinematics of folds in general and super-imposed folds in particular have been worked out and the principles applied for elucidating the structure of pre-Cambrian rocks of Rajasthan and the Jutogh-Chail rocks of the Simla Himalayas.

Prof. C. S. Seshadri*

The Shanti Swarup Bhatnagar Prize for Mathematical Sciences for the year 1972 has been given to Prof. C. S. Seshadri, Professor of Mathematics, Tata Institute of Fundamental Research, Bombay, jointly with Prof. A.S. Gupta, Professor, Department of Mathematics, Indian Institute of Technology, Kharagpur.

Prof. Seshadri's significant contribution is in algebraic geometry, mainly the moduli problems for vector bundles on curves and the construction of quotient spaces modulo-reductive algebraic groups. In a joint paper with Prof. M. S. Narasimhan, he gave a characterization of the stable bundles of D. Mumford in terms of unitary representation of certain discrete groups. Using this result, he succeeded in constructing the module varieties as normal projective varieties. This work is regarded as basic in the field. Another important work of Prof. Seshadri which has found wide application in many moduli problems relates to the quotient of the space of stable points under a reductive algebraic group.

Malted Beverage Plant Based on Vegetable Protein

CFTRI Process Commercialized

A commercial plant for the manufacture of malted beverage based on vegetable protein of cocoa has been set up by Cocoa Products & Beverages [illegible]t. Ltd, Madras, using the know-how developed by the Central Food Technological Research Institute (CFTRI), Mysore.

The 500 kg per day capacity plant, designed and installed with technical assistance from CFTRI, successfully completed production trials a few weeks ago. The product has been reported to have good consumer acceptance and the firm is expected to market shortly the product under the brand name 'Promivit'.

Malted beverages are considered nutritious food for both convalescent and healthy people. Most of these products are milk-based. In the CFTRI process, milk is completely replaced by high-purity vegetable protein isolate. The process is simple and does not need complicated or costly equipment. The product has about 20% protein content, whereas conventional products with established brand images have only 7-8% protein content. The protein isolate used in the product is being commercially produced in the country on the basis of the CFTRI technology.

Beneficiation and Cold-Bonded Pelletization of Iron Ore Fines

Jorhat Laboratory's Technology

The Regional Research Laboratory (RRL), Jorhat, has developed processes for beneficiation and cold-bonded pelletization of iron ore fines. For beneficiation, a chemical composition has been developed which selectively disperses clay and other aluminous materials and concentrates the ore fines. The cold-bonded pellets developed at RRL have been evaluated and found to be comparable in quality with normal heat-hardened pellets. The processes of beneficiation and cold-bonded pelletization find application in the steel industry.

For further development of both the processes aimed at eventual commercialization, the laboratory has entered into a collaborative agreement with the Hindustan Steel Ltd.

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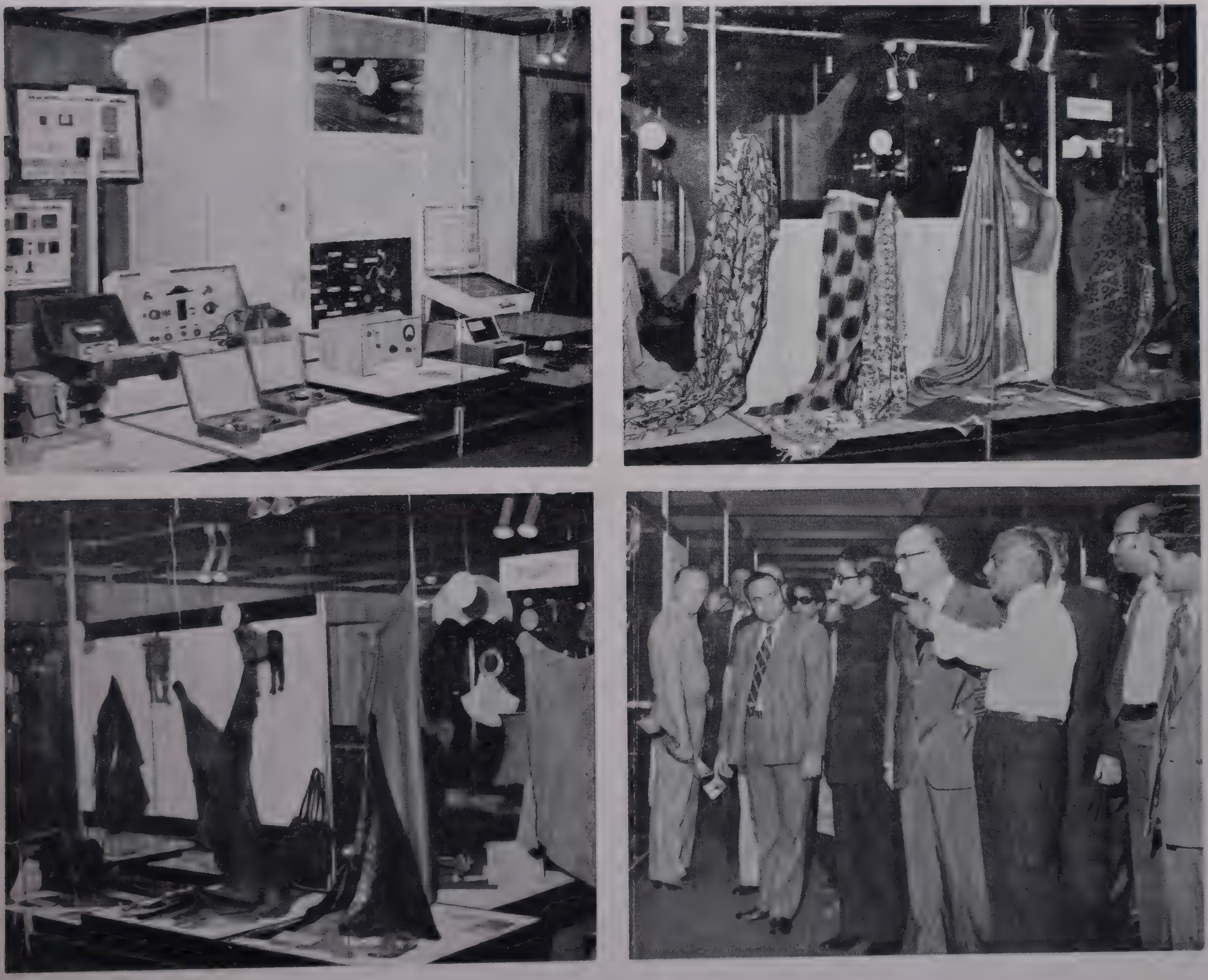
*Absent on the occasion

CSIR Participates in Zagreb International Fair

The Council of Scientific & Industrial Research had set up a pavilion to depict the development of science and technology in India at the International Autumn Fair held at Zagreb, Yugoslavia, from 12 to 21 September 1975. Organized by the International Scientific Collaboration Unit of CSIR, the exhibition projected a wide range of products and processes developed at the national laboratories and other scientific institutions in India. Scientific and technological advances in the field of electronics, electro-medical instruments, glass and ceramics, metallurgy, telecommunication, microwave components, carbon products, ultrasonics, scientific instruments, jute fabrics, processed leather, leather goods, Indian medicinal plants, and environmental engineering were depicted.

The Prime Minister, Commerce Minister, Finance Minister and Board of Trade Minister of Yugoslavia, who visited the pavilion, besides the Indian Minister of Commerce Prof. D. P. Chattopadhyaya, appreciated the display on the progress made by India in the field of science and technology. The CSIR team which organized the CSIR pavilion consisted of Shri R. Krishnamachari, Scientist, Central Road Research Institute, New Delhi, Dr J. N. Kansal, Public Relations Officer of CSIR, Shri R. C. Chandra, Exhibition Officer, Birla Industrial & Technological Museum, Calcutta, and Shri S. K. Mago, Scientist, Central Scientific Instruments Organisation, Chandigarh.



CSIR Pavilion at International Fair at Zagreb : (*clockwise from bottom left*)—Leather and leather goods; Scientific instruments; Jute fabrics; Prof. D. P. Chattopadhyaya (dark suit) and Dr Ludwiger (to the left of Prof. Chattopadhyaya), Board of Trade Minister, Yugoslavia, seeing the CSIR exhibits

Progress Reports

RRL, Jammu, Annual Report : 1974

The Regional Research Laboratory (RRL), Jammu, continued to pursue its programmes of providing consultancy and technology transfer services to various private and government agencies. According to its annual report (Pp. 66, royal 8vo) for 1974, the laboratory provided consultancy services to about 30 parties, earning thereby a sum of Rs 58,000. A process for the preparation of menthol from dementholized oil was released through the National Research Development Corporation of India to two parties and a plant for manufacturing scopolamine hydrobromide and *n*-butyl bromide was erected by Phytochem International Ltd at Jammu. The laboratory also rendered technical assistance in commissioning the plant.

For extraction of borax and elemental sulphur from Puga valley the laboratory fabricated the necessary equipment. Geothermal energy will be utilized for refining crude borax. A complete borax plant for processing about 50 kg of borax ore per batch has been commissioned at Puga. A 50 kg/batch sulphur extraction unit gave promising results in trials; certain modifications in the unit are however being made.

Two cultivars of *Cymbopogon*, RRL-16 (citral-rich) and RRL-14 (geraniol-rich), were identified and were being released to growers. A process was standardized for isolating citral from *Cymbopogon pendulus* (RRL-16). The quality of citral produced from RRL-16, the new source, has been approved by a number of leading perfumery houses. The geraniol produced from the oil of RRL-14 was evaluated by perfumery houses and found to be of very high quality, resembling geraniol-ex-palmarosa.

A survey of mushrooms carried out by the laboratory has revealed a number of delicious edible mushrooms in the region. Strain No. 89 (*Agaricus bisporus*) released to mushroom growers in 1973 has been found to give higher yield than the spawn obtained from other sources. About 2000 spawn bottles were supplied during the year. The commercial cultivation of the high-priced edible mushroom, *Pleurotus ostreatus* (Dhingri), has been perfected.

Investigations were carried out on a number of fast-growing plants for making paper pulp. Work on the preparation of straw boards from agro-wastes, viz. rice straw, *Cymbopogon* grass, cotton stems and mentha marc, has been carried out in 60 kg capacity laboratory plant. In addition, cellulosic derivatives have been prepared from waste paper. Pine wool prepared by wet defibration has been found to be a satisfactory and cheap stuffing material for cushions. Pine bark, fir saw-dust and 3-5% phenol-formaldehyde gave boards with modulus of rupture in the range 94-112 kg/cm^2 and water adsorption of 30-86%.

Dillapiole (a dimethoxy methylenedioxyphenyl compound) constitutes about 30% of the total sowa oil. This compound has been converted to dimethoxypiperonylic acid. A series of amides of this acid has been prepared for pharmacological and entomological evaluation, including their synergistic activity.

Research on processing, preservation and canning of apples, plums, walnuts and citrus fruits indigenous to the region was continued. The National Fruit Products, Ludhiana, was provided with the technical know-how for canning cherries in thin syrup. One thousand cans were produced by the party under the supervision of the laboratory.

Some of the other fields in which the laboratory is carrying out studies are : dyeing and dressing of sheep skins, surface coating and oils, breeding and screening of medicinal plants, and fish cultivation in the Jammu region.

A survey of industries in Jammu and Kashmir was carried out during the year, and the survey report formed the basis for a Research and Industry Get-together.

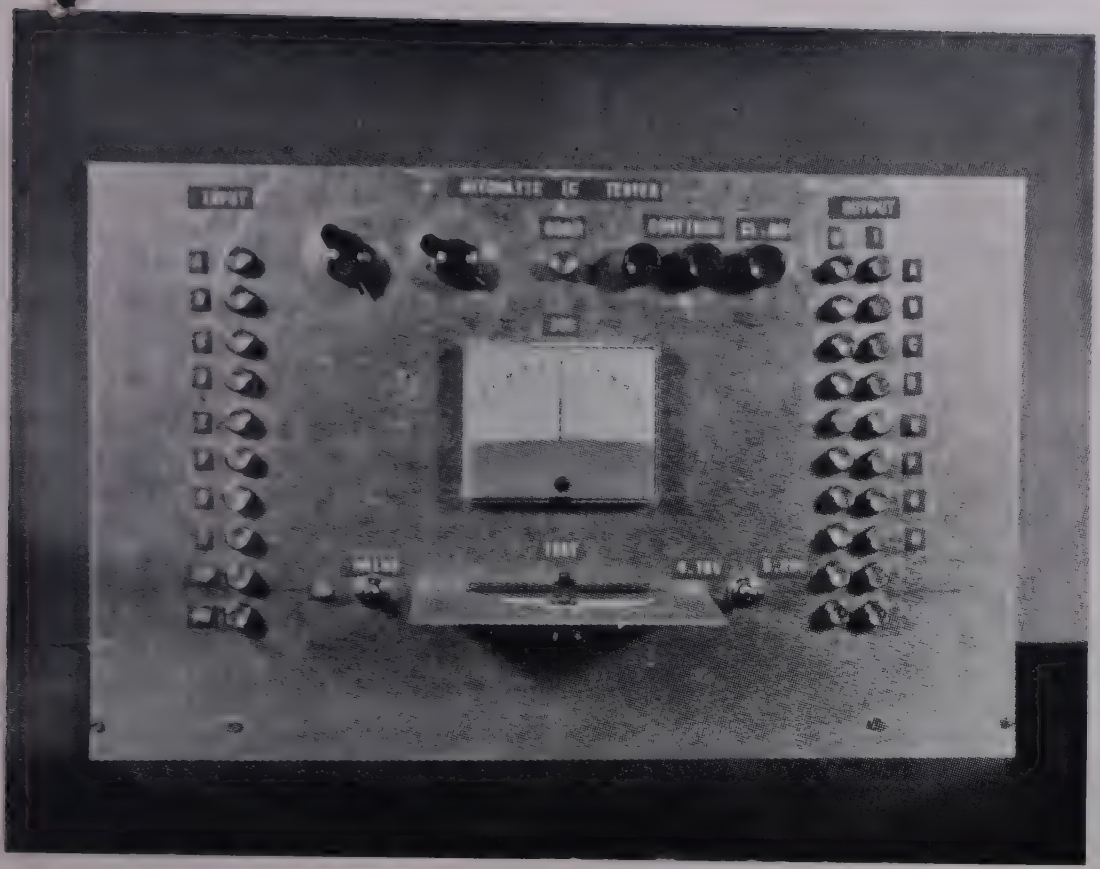
PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Automatic Integrated Circuit Tester

In fabricating digital systems using a large number of integrated circuits (IC's), it is necessary to test every chip before wiring it in circuit. It would not be possible to test them one by one for worst case input, output conditions, truth table verification and for short circuit between pins unless it is done automatically.

The National Aeronautical Laboratory, Bangalore, has developed an automatic static IC tester for testing TTL digital integrated circuit of 7400 series and allied types. The tester comprises (i) an internal clock of 40 kHz frequency, (ii) a squence generator with 1024 possible logic patterns, (iii) isolators for generating identical but isolated patterns for test and reference IC's, (iv) attenuators for generating worst case signals for the test IC, (v) input comparators for comparing the input patterns of test and reference IC's, (vi) output level checker comprised of Schmitt trigger circuit to check the worst case '0' and '1' output levels, and (vii) output comparator for comparing the outputs of test and reference IC's.

The tester simultaneously performs dc and functional test automatically or semi-automatically. Static test is per-



Automatic integrated circuit tester developed at NAL, Bangalore

formed on IC for input, short circuit, functional or truth table failure, worst case input logic levels response and worst case output logic levels at all the possible input combinations of 0's and 1's at the various inputs.

The specifications of the IC tester are as follows :

Power supply

Mains : 230V, 50Hz
Internal : ± 5V regulation 1% for main unit
Worst case for test IC : 4·75V for test IC
5·25V (reference)
Consumption : less than 50W

Operating frequency

Internal clock : 40 kHz

Input

Number of input patterns generated (gray code) : 1024
Worst case logic level '0' : 0·8 V
Worst case logic level '1' : 2·0 V

Output

Full load on logic levels '0' : −16 mA
Full load on logic levels '1' : 400 mA
Level check logic level '0' : 0·4 V
Level check logic level '1' : 2·4 V

The tester finds application in electronics industry, research laboratories and industries manufacturing IC's. It is a handy tool for manufacturers of electronic systems using integrated circuit designs, such as computers, electronic desk calculators, and data system. Its main advantage is that about 1000 IC's can be tested in an hour.

The exact demand for the tester is not known, but it is bound to increase with indigenous availability.

The main components required are IC's transistors, diodes, resistors, capacitors, miniature lamp and holder, transformer, push-button micro-switch, toggle switch, p.c. cards, and edge connector for p.c. cards. Except for IC's and IC sockets, all the components are available indigenously.

Drilling machine, sheet metal shearing and bending machine, painting unit, dc oscilloscope and multimeter are the main equipment required, and all these are available indigenously.

The total capital outlay for setting up a unit capable of producing 20 units of automatic IC tester per annum has been estimated at Rs 1·85 lakh (comprising Rs 35,000 as fixed capital on equipment, land and building, and Rs 1·50 lakh as working capital). The cost of production has been estimated at Rs 10,450 per tester; the prevailing cost of an imported tester is Rs 30,000.

Further details can be had from : The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PATENTS FILED

677/Cal/75 : Improvements in or relating to catalyst for gas recombination in sealed storage cells and batteries, S. Palanichamy, P. V. Vasudeva Rao & H. V. K. Udupa—CECRI, Karaikudi.

695/Cal/75 : Improvements in or relating to inhibitive pigments, K. S. Rajagopalan, S. Guruviah, M. Sundaram & V. Chandrasekaran—CECRI, Karaikudi.

696/Cal/75 : A new type of liquid crystal material for use in electro-optical display devices, V. G. Bhide, Subhas Chandra & S. C. Jain—NPL, New Delhi.

697/Cal/75 : Preparation of synthetic iron oxide pigments, T. P. Prasad, V. V. Rama Sastry, J. S. Murty & B. R. Sant—RRL, Bhubaneswar.

701/Cal/75 : Improvements in or relating to hard anodizing of aluminium and its alloys in sulphuric acid electrolyte using alternating current, B. A. Shenoi, V. Balasubramanian & S. John —CECRI, Karaikudi.

746/Cal/75 : A process for the manufacture of special charcoal blocks from indigenous raw materials for polishing metal surfaces, D. C. Mitra, T. C. Tarafdar, D. P. Nag, A. Majumdar,

K. Raja & N. G. Banerjee—CFRI, Dhanbad.

747/Cal/75 : Improvements in or relating to continuous counter-current ion-exchange apparatus, M. N. Prajapati & B. D. Dasare—CSMCRI, Bhavnagar.

748/Cal/75 : Electrochemical preparation of β-phenylethylamine hydrochloride from benzyl cyanide, H. V. K. Udupa, V. Krishnan & K. Raghupathy—CECRI, Karaikudi.

811/Cal/75 : Electrochemical preparation of 3-aminomethylpyridine dihydrochloride from 3-cyanopyridine, H. V. K. Udupa, V. Krishnan & K. Ragupathy—CECRI, Karaikudi.

812/Cal/75 : Improvements in or relating to the electrochemical preparation of β-alanine hydrochloride from cyanoacetic acid, H. V. K. Udupa, V. Krishnan & K. Ragupathy—CECRI, Karaikudi.

813/Cal/75 : A process of recovering precipitated calcium carbonate from press mud of sugar factories following carbonation process for clarification of sugarcane juice, S. C. Das & S. N. Dutta—RRL, Jorhat.

836/Cal/75 : A process for the manufacture of dibenzyl disulphide, (Mrs) S. Laxmi, V. S. B. Rao & M. S. Iyengar—RRL, Jorhat.

837/Cal/75 : A new extinguishing medium for extinguishing fires in flammable liquids, G. R. N. R. Badami & T. P. Sharma--CBRI, Roorkee.

838/Cal/75 : A process for making high polymeric dispersant suitable for effecting separation of clays and other materials containing active hydroxyl groups on the surfaces present in ores and minerals, T. C. Saikia, G. K. Tike, J. P. Moyalan, B. D. Chattaraj, M. Chakravarty, D. Ganguly & S. N. Dutta—RRL, Jorhat.

CRI Training Course

The Cement Research Institute of India (CRI), New Delhi, is organizing a training course on 'Geological Investigations, Raw Materials Evaluation and Mining Practices in Cement Industry' from 15 to 20 December 1975.

The course will highlight the trends of rationalization of geological investigations, importance of raw materials assessment, proper development and advancing of a quarry and the need for an interdisciplinary approach among geologists, mining engineers and process engineers in the field of cement manufacture. The syllabus of the course includes : programming and execution of limestone exploration; patterns and techniques of sampling; preparation of maps, sections and assay plans, calculation of reserves; rapid methods of analysis; assessment scheme for limestone evaluation; collection and collation of parameters for feasibility reports; and conservation of high-grade limestone.

Further details of the training course may be obtained from the Director, Cement Research Institute of India, M-10 South Extension II, New Delhi 110049.

PERSONNEL NEWS

Appointments/Promotions

The following Senior Scientific Assistants have been promoted as Scientists 'A' in the Central Electrochemical Research Institute, Karaikudi : Shri K. Naganathan (5 May 1972); Shri C. Rajagopal (3 July 1974); Shri G. N. Kannan (28 February 1975); and Shri R. Balasubramanian (28 February 1975).

* * *

The following Scientists have been promoted in the National Geophysical Research Institute, Hyderabad : Shri B. Venkat Narayana (from Scientist 'A' to Scientist 'B'; 5 November 1974); Shri M. S. Chakravarthi (from Scientist 'Bl' to Scientist 'Cl'; 1 April 1975); Dr V. Divakara Rao (from Scientist 'A' to Scientist 'B'; 6 May 1975); Dr K. R. Ramanuja Chary (from Scientist 'B' to Scientist 'C'; 11 May 1975); Dr K. Roy Chowdhury (from Scientist 'B' to Scientist 'C'; 3 April 1975); and Dr S. C. Garde (from Scientist 'B' to Scientist 'C'; 11 May 1975).

* * *

Dr Tapan Chakrabarti has been appointed Scientist 'B' in the National Environmental Engineering Research Institute, Nagpur, with effect from 16 October 1975.

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CSIR NEWS

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Seminar on Alternative Technology

The Council of Scientific and Industrial Research (CSIR), in collaboration with the Indian Institute of Advanced Study (IIAS), Simla, organized a seminar on Alternative Technology from 16 to 19 September 1975 at IIAS, Simla. The object of the seminar was to develop a conceptual framework for developing alternative technologies; discuss specific technologies in select areas; and work out a machinery for the implementation of a programme of alternative technology on an experimental basis and on a large scale. Twenty scientists, social scientists and administrators from different academic and research institutions participated in the seminar.

Shri P.N. Haksar, Deputy Chairman of Planning Commission and Vice President of CSIR, pointed to, in his inaugural address, the need for having a critical look at the programmes of development of scientific research with a view to matching them with the social needs of the country. He stressed that pragmatism should be the basis for future work in this direction in the country. In their efforts towards this end the intellectuals in India should not isolate themselves from the realities of the country. He felt confident that research workers would give maximum attention to solving the problems of the common man in the country.

Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, in his introductory remarks expressed the hope that scientists and technologists would be a source of inspiration and solace to the common man in the country. He stressed the point that their efforts should be relevant to the country and its citizens besides being related to the international aspects of science.

In his welcome address, Dr S.C. Dube, Director of IIAS, emphasized that the future was deeply rooted in human consciousness and that it could be viewed as an integral aspect of the human condition. By concentrating on the problem of being through positive intervention man could carve out for himself a desirable and preferred future. He also indicated the need to consider the shape of human society in the next 25 years or the next 100 years in view of the urgency dictated by rapidly changing components and dimensions of human existence.

The seminar was held in six sessions. The first session was devoted to providing a definition, meaning and content of alternative technologies. In view of the multiplicity of terms like appropriate technology, intermediate technology, soft technology or labour-intensive technology that are prevalent to describe the same problem, the session felt that it was rather difficult to understand clearly the various implications of these problems and arrive at a concrete value-free definition of alternative technologies. It was also pointed out that the problem of analytical analysis and evaluation of alternative technologies had to be evolved.

The second session, devoted to the problems of energy, focussed on energy demands in India in AD 2000. The various options open for the use of different forms of energy were also considered and deliberated upon. Major emphasis was laid on providing energy at relatively cheaper rates to the rural and weaker sections of the society. In this context, the use and role of biogas and solar energy was emphasized.

The third session was devoted to a study of the problems of urban planning and rural development. Emphasis was laid on the development of integrated agro-based industries. Specific case studies of using agro-products in the small-scale sector dispersed in rural areas were presented. The discussion brought out the point that such industries dispersed in rural areas would be viable economically and could meet the present-day social objectives.

The fourth session, devoted to industrial case studies to incorporate some of the different technologies to suit the socio-economic needs of the country, deliberated on the possibility of small-scale industrial plants for three major industries, viz. cement, paper and textiles. The discussions on the case studies indicated the need to study other industries from the point of view of scaling down the unit of production.

Considering the importance of reorienting the teaching of science and technology in the country so that students are psychologically attuned to the development and use of alternative technologies, the fifth session addressed itself to the problem of teaching science and technology in the country. Emphasis was laid on the need to develop new curricula for science and engineering students with accent on the exposition of problems which required scientific and technological solutions.

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The last session discussed the problems of implementation and organization. Emphasis was laid on the type of village structure or organizational structure which would be conducive to the development of alternative technologies. It was pointed out that the current tendency of having mega-organizations is not conducive to the development of the philosophy of alternative technologies.

In his valedictory address, Dr S.C. Dube summarized the key issues in technological choices that had to be made to solve a series of complex problems in the face of a rapidly changing social structure.

Aromatic and Medicinal Plants and Allied Industries : Get-together at RRL, Bhubaneswar

A get-together on Cultivation of Aromatic and Medicinal Plants and Development of Allied Industries in Orissa Region was organized by the Regional Research Laboratory (RRL), Bhubaneswar, on 26 September 1975.

Inaugurating the get-together, Shri Bhagirathi Gomango, Minister of State, Agriculture and Cooperation, Government of Orissa, said that no systematic and extensive cultivation of aromatic and medicinal plants in a scientific manner had been taken up in Orissa but many other states in the country had already made some progress in this direction, earning considerable amounts of foreign exchange after meeting the internal demand for essential oils and crude drugs. Climatically, Orissa is suitable for growing a number of aromatic and medicinal plants and there are about 7.2 million acres of waste land in the state which are subjected to soil erosion and in addition to this there are about a million acres of coastal saline and water-logged land which could be very suitably used for the cultivation of aromatic and medicinal plants. He stated that the programme drawn up in the get-together could be implemented only when there was full coordination between this laboratory, government officials and industrialists. He hoped that the deliberations of the get-together would go a long way in popularizing the cultivation of such plants and development of allied industries in the region. The Minister expressed happiness over the introduction of medicinal plants like citronella, palmarosa, cinnamon and eucalyptus by the laboratory. Cultivation of these could now be taken up commercially. Extending full cooperation of the State Government the Minister urged the concerned government officials to seriously take up the suggestions made, and with the help of RRL, Bhubaneswar, to set up a task force to implement a time-bound programme which could be reviewed from time to time.

Prof. T. S. Sadasivan, consultant to CSIR, in his presidential address said that the growth of industry relating to farm technology and isolation/characterization of aromatic and medicinal plants and synthetic products in India was of recent origin, although such plants had been known for centuries. He explained the philosophy of plant introduction, problem of eco-environments and breeding of new cultivars on crops and aromatic and medicinal plants, and plant exploration. Prof. Sadasivan said that plans were afoot to establish germplasm banks in some of the plant-based laboratories of CSIR from plant explorations in this subcontinent. These, when fully established, would aid in a big way the ongoing breeding programme. In this effort the Bhubaneswar laboratory could play an active part by organizing local expeditions in their wild flora repositories, he added.

In his welcome address, the Director of RRL, Prof. P. K. Jena, explained the purpose of the get-together and mentioned that the laboratory had been trying to develop and introduce various commercially viable medicinal and aromatic plants for which it had the resources of personnel and research facilities, including an experimental farm. Prof. Jena suggested that on a cooperative basis with the involvement of the government, a mechanism should be evolved for collecting the essential oils and crude drugs from the cultivators and selling them to the pharmaceutical and perfumery houses in the country and abroad. If the farmers were assured of the market for these items and received fair return through a government-sponsored organization they would be encouraged to take up the cultivation of these plants and to set up allied industries. Prof. Jena expressed the hope that the deliberations of the get-together would provide guidelines for the development of aromatic and medicinal plants-based industries in Orissa and other states.

In the technical session, twelve invited papers dealing with the potentiality, cultivation of aromatic and medicinal plants and development of allied industries in Orissa region were presented. More than 60 scientists, technologists, government officials and industrialists took part in the deliberations of the technical session. It was the general consensus that the cultivation of aromatic and medicinal plants should be taken up in a big way in the state. An appeal was made to the concerned governments and private parties to take up large-scale cultivation of these plants in the state of Orissa. The discussions held at the session pinpointed areas in which other plant-based CSIR laboratories could interact in the project termed as 'Plant Introduction and Proving Trials' in which the Departments of Agriculture and Forestry were willing to collaborate with RRL, Bhubaneswar. The immediate need was to identify the planting zones of Orissa demarcated for successful introduction of aromatic and medicinal plants. The choice of the planting materials would be such that the technology involved is simple, marketability is not much of a problem and loss in storage is minimal.

During the get-together a working group consisting of eminent scientists met to discuss the strategy for the small-scale cultivation of *Atropa belladonna*, *Pyrethrum*, *Vinca rosea*, *Amm* *majus*, *Solanum khasianum* and *Datura metel*. The cultivation of these plants had to be undertaken in collaboration with the State Agriculture and Forest Departments at Pottangi (Koraput district), Daringbadi (Phulbani district) and Simlipal (Mayurbhanj district). The group felt that aromatic plants could be grown later when small-scale industries capable of handling some of the essential oil-bearing plants develop on a cooperative basis, or when industrialists are ready to take the know-how from other plant-based laboratories. It was suggested that RRL, Bhubaneswar, could act as an important link with other CSIR plant-based laboratories on the one hand and the Agriculture and Forest Departments on other. These would be possible if the important medicinal and aromatic plants and their cultivars currently available with the National Botanic Gardens, Lucknow; Regional Research Laboratory, Jammu; and Central Indian Medicinal Plants Organisation, Lucknow, could be collected and cultivated in the medicinal plants farm at RRL, Bhubaneswar. These germplasm collections would go a long way in giving the data on performance of some of these under conditions obtaining in Bhubaneswar. They would also give planting materials to the Agriculture and Forest Departments and other agencies, such as the Orissa State Tribal Development Cooperative Society Ltd, for trying out materials other than the ones listed above. Of particular interest was the question of supplementing steroid sources other than *Dioscorea* with newer wild plants such as *Solanum khasianum* and *Costus speciosus*.

Uses of Plywood : Conference at IPIRI

A conference on the uses of plywood in engineering, architecture, housing and packaging, was organized by the Indian Plywood Industries' Research Institute (IPIRI), Bangalore, on 6 September 1975. One hundred and twelve delegates from all over the country, consisting of scientists, engineers, architects, government officials and representatives of other organizations, participated in the conference, which was inaugurated by the chairman of IPIRI, Shri B.N. Kapur The main objective of the conference, as stated in his welcome address by Dr Joseph George, Director of IPIRI, was to highlight the possibilities for utilization of plywood rationally and profitably on a wider scale in engineering construction, agriculture and housing.

The conference was divided into four technical sessions devoted to the applications of plywood in (i) adhesives, hardware, fasteners and finishes; (ii) engineering construction, architecture, housing and furniture manufacture; (iii) agriculture; and (iv) packaging.

Some of the important recommendations made at the conference are as follows :

(1) All data available on plywood manufactured in the country should be collected so that engineers and architects could specify the right grade of material for the right job.

(2) IPIRI in collaboration with the various committees of the Indian Standards Institution should prepare a consumer guide giving relevant information on the design of plywood structures and the specifications for suitable types and grades of plywood along with their characteristics.

(3) IPIRI should provide data on the durability of plywood grain storage bins, so that these could be recommended to farmers.

(4) Aesthetically acceptable packing cases of optimum size should be designed, and easy disposability of plywood containers, where necessary, should be evaluated.

In the concluding session, Shri K.S. Lauly, General Manager, The Indian Plywood Manufacturing Co. Ltd, Dandeli, and Vice Chairman of IPIRI, said that engineers, architects and other users of building materials should take a new look at plywood as one of the important materials of construction. He invited the participants to approach IPIRI and plywood manufacturers for further information, guidance and technical help required in solving problems concerning the uses of plywood.

An exhibition designed to give the participants a clear idea of some of the applications of plywood in engineering, agriculture and housing was also organized by the institute. Exhibits included a prefabricated plywood house which was elegant and at the same time functional; partially prefabricated low-cost houses; demountable prefabricated ministructures of plywood like milk booth and payment stall; glued plywood web beams, portal frames and cantilevers; plywood cantilever shell; bio-gas tank and liquid storage tank of plywood; grain-storage bins of plywood for domestic and rural use, both indoors and outdoors; all-plywood knock-down furniture; and plywood packing cases and drums.

CGCRI Develops a New Type of Dryness Tester

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed a new type of dryness tester which measures accurate to within ± 3%, is easy to operate and is especially suitable for checking the drying condition in ceramic goods with large complicated shapes, e.g. plaster moulds, refractory pots and blocks.

In most of the ceramic articles and shapes the moisture content has to be

Dryness tester developed at CGCRI

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controlled quite closely, and periodic checking of the extent of drying is essential. But ordinary physical methods are of little use in the rapid determination of moisture in ceramic and refractory articles, particularly when these are very heavy and complicated in shape. Such problems, posed during the large-scale production of optical glass in refractory pots made by casting in giant plaster moulds, have been solved successfully with the use of this new dryness tester, which has great potential in the ceramic and refractories industry in general.

The tester developed at CGCRI is simple and inexpensive (about Rs 1000 per set), and can be handled easily by workers in a factory. It is a portable ac set, consisting of a 800 kc/s oscillator, a high *Q* tuning circuit and a linear-scale amplifier detector to measure the terminal voltage of the tuning circuit capacitor having a pair of contact shoes which can be pressed on the test surface as and when required.

When there is moisture in the test body, an equivalent high-frequency loss is expected to short the tuning capacitor so that the overall *Q* value of the tuning circuit falls down to an indication corresponding to the moisture content of the body. The moisture content is indicated on a fore-calibrated microammeter used in a cathode-follower balanced circuit of the valve voltmeter.

Zero and the maximum of the scale being pre-adjusted for zero and maximum dryness, the scale reading is a direct indication of the moisture content of the test body. The operation consists in pressing the contact shoes on the test body and tuning the variable condenser to obtain a peak value indication of the scale.

The reliability of the results has been confirmed by the close agreement between the curves representing meter reading vs moisture content and meter reading vs actual moisture content determined gravimetrically.

Parties interested in performance trials and/or prototype apparatus may contact the Director, CGCRI.

CBRI Design and Techniques Adopted in 'India Population Project'

The design and techniques developed by the Central Building Research Institute (CBRI), Roorkee, are being utilized in the construction of health buildings under the India Population Project. These buildings, about 650 in number, are being constructed at a cost of Rs 50 million in six districts of Uttar Pradesh, viz. Saharanpur, Muzaffarnagar, Lucknow, Sultanpur, Rai Bareilly and Pratapgarh. Primary health centres, sub-centres, midwife training centres, maternity homes and auxiliary nurse midwife centres will be housed in these buildings.

Extensive studies on the functional aspects of these buildings were carried out before finalizing the design. Prefabricated roofing units, lintels, sunshades, shelves for storage, doors and windows used in the buildings would help save scarce materials like cement (35%) and steel (5%), besides effecting an overall economy of about 20% compared to conventional RCC roof.

One of the primary health centres was inaugurated by the Deputy Health Minister of the Government of India on 17 October 1975. An exhibition on the techniques of construction and design of the health buildings was also arranged by the institute on this occasion.

CFTRI Assists in Setting up Fruit and Vegetable Processing Plant

The Karnataka Agro-Industries Corporation, Bangalore, has set up a fruit and vegetable processing plant at Hebbal, Bangalore, with technical assistance from the Central Food Technological Research Institute (CFTRI), Mysore. The plant has a capacity to handle five tonnes of raw materials in an eight-hour working shift. The plant was inaugurated on 25 September 1975. Karnataka has good scope for development of fruit and vegetable processing and preservation industry as suitable varieties of mango, pineapple, tomato, papaya, guava, banana and orange are grown in the state.

Gas-Mask Testing Facilities at CMRS

The Central Mining Research Station (CMRS), Dhanbad, has developed facilities to test the efficiency of various types of gas-masks and respirators.

The working environment under different industrial conditions in mines and factories may become surcharged with high concentrations of obnoxious gases. To work under such unusual conditions the use of gas-masks or respirators is essential. But these must be of right type fulfilling the standard specifications prescribed for them. Manufacturers and users of these items may make use of the facilities developed at CMRS to check the quality of their products.

Conference Briefs

Shri J.M. Dave of the National Environmental Engineering Research Institute (NEERI), Nagpur, participated in the international conference on Environmental Sensing and Assessment, organized jointly by the World Health Organization, U.S. Environmental Protection Agency, University of Nevada and the United Nations Environment Programme in Las Vegas, Nevada (USA) from 14 to 19 September 1975. The conference also formed a part of the third joint conference on Sensing of Environmental Pollutants.

The object of the conference was to have a forum for exchange of information on the environmental quality assessment and on the applied technology for evaluating the impact on environment, with respect to the health and other aspects in developed and developing countries.

The conference, attended by more than 1000 delegates from 40 countries, was divided into two plenary sessions and 38 technical sessions with about 280 papers presented.

In the third session, Shri Dave presented a paper on the basic needs for monitoring air pollutants in a developing country. The paper dealt with the problems of air pollution in India, its status, and nature of pollutants affecting it. It also described briefly the techniques developed by NEERI for air monitoring, such as equipment, analytical procedures, sampling procedures and data collection. The paper generated considerable discussion because of the simplicity of the entire cost factors in monitoring adopted by India. The cost of collection of data by the techniques developed by NEERI is 1/10th to 1/20th of the cost for obtaining similar data in European countries. A number of queries were raised with respect to the reliability and confidence limit of the system and it was pointed out that it is comparable to the sophisticated modern equipment used in the developed countries.

CSIR Support To Research

New Schemes

Following is the list, research committeewise, of new research schemes (68) sanctioned by the Council of Scientific & Industrial Research.

Chemical Research Committee

Photochemistry of anthraquinone derivatives : photosubstitution and photosensitization reactions—Prof. S. Aditya, Department of Applied Chemistry, University College of Science & Technology, Calcutta.

Studies on the electrochemical properties of mineral-solution interface—Dr K. C. Ray, Reader in Chemistry, Visva-Bharati, Santiniketan (West Bengal).

Polarography and metal complexation with organic compounds containing sulphur—Dr S. K. Tiwari, Zakir Husain Engineering College, Aligarh Muslim University, Aligarh.

Reverse osmosis—Dr Fasih Ahmed Siddiqi, Department of Chemistry, Aligarh Muslim University, Aligarh.

Chemical transport reaction in solid state—Dr N. B. Singh, Department of Chemistry, Gorakhpur University, Gorakhpur.

Molecular taxonomic studies on the order Rutales—Prof. D.P. Chakraborty, Department of Chemistry, Bose Institute, Calcutta.

Synthesis, characterization and reactions of compounds of lanthanides and actinides with ligands having both donating and acceptor capability—Dr B. S. Manhas, Department of Chemistry, Guru Nanak University, Amritsar.

Synthesis of new quasi-aromatic systems derived from polyfluorinated 1, 3-diketones and their applications as NMR shift reagents—Prof. K. C. Joshi, Department of Chemistry, University of Rajasthan, Jaipur.

Assemblies of charged particles in continuous media : theoretical and experimental investigations—Prof. M. Dutta, Bose Institute of Physical Sciences, Calcutta University, Calcutta.

Anodic oxide films on valve metals—Dr R. K. Nigam, Department of Chemistry, Kurukshetra University, Kurukshetra.

Pesticides & Agro-chemicals Research Committee

Synthesis of some sulpha-aza heterocyclic compounds and their effect on plants as growth stimulants or retarders—Dr D. S. Despande, Department of Chemistry, Science College, Nanded (Maharashtra).

Polymers Research Committee

Development of fluoro-olefin polymers based on tetrafluoroethylene—Dr S. B. Nair, Polymer Division, Shri Ram Institute for Industrial Research, Delhi.

Energy Research Committee

Secondary recovery of oil by polymer flooding—Dr S. K. Baijal, Indian School of Mines, Dhanbad.

Corrosion Research Committee

Studies on the mechanism of inhibition action in acid solution—Dr Amarnath Maitra, Department of Chemistry, Delhi University, Delhi.

Microbiological corrosion of metals used in underground service and its prevention—Dr G. N. Pandey, Chemical Engineering Department, H. B. Technological Institute, Kanpur.

Chemical Engineering Research Committee

Studies on performance of molten salt reactor for producing nitropropanes—Prof. R. Kumar, Department of Chemical Engineering, Indian Institute of Science, Bangalore.

Studies in development and design of agitators for processing highly viscous Newtonian and non-Newtonian materials—Dr K. K. Tiwari, Department of Chemical Technology, Bombay University, Bombay.

Fuels from wastes—Prof. S. H. Ibrahim, Department of Chemical Engineering, Regional Engineering College, Tiruchirapalli.

Mechanical & Electrical Engineering Research Committee

Heat transfer from humid air to freezer surfaces under frosting conditions—Dr H. K. Varma, Roorkee University, Roorkee.

Improvements in tillage implements and traction devices (phase 1)—Prof. K. N. Singh, Department of Agricultural Engineering, Agricultural University, Pantnagar, Nainital.

Mechanics of forming and forging at elevated temperatures—Dr Purandar Bhattacharya, Regional Institute of Technology, Jamshedpur.

Minimization of electrical power system losses in Rayalaseema—Prof. P. Subramaniam, Department of Electrical Engineering, S.V. University, Tirupati.

Stress analysis in production process-development and application of a special technique—Dr H. Chandrasekharan, Department of Mechanical Engineering, Indian Institute of Technology, Madras.

Studies on vermiculite insulating sleeves for feeders—Dr H.N. Srinivasan, Mechanical Engineering Department, Indian Institute of Science, Bangalore.

Thin film studies of lubricants with several additives and development of allied measuring ultrasonic equipment —Dr J. P. Sharma, Mechanical Engineering Department, Indian Institute of Technology, New Delhi.

Analysis of plastic deformation in the case of multi-hole extrusion and drawing—Dr N. S. Das, Regional Engineering College, Rourkela.

Metals Research Committee

Recovery of copper from mill tailings of Indian copper plants—Dr K.A. Natarajan, Karnataka Regional Engineering College, Surathkal (S.K.).

Studies on the kinetics and mechanism of strengthening and high-temperature processes in alloys—Prof. J. K. Mukherjee, Materials Science Centre, Indian Institute of Technology, Kharagpur.

Development of self-setting moulding processes for ferrous and non-ferrous foundries, utilizing indigenous raw materials and industrial waste products—Dr S. Seshan, Department of Mechanical Engineering, Indian Institute of Science, Bangalore.

Biological Research Committee

Genetics studies on consanguinity in Andhra populations—Dr M.R. Chakravarti, Department of Human Genetics & Physical Anthropology, Andhra University, Waltair.

Studies on leaf surface myco-organisms of sunflower—Dr M.N. Gupta, Botany Department, Agra College, Agra.

Passage of polio and some respiratory virus antibodies across the placental barrier—Prof. K.L. Mukherjee, Department of Biochemistry, Institute of Post-graduate Medical Education and Research, Calcutta.

Cytogenetic studies on the yellow passion fruit—Prof. S.G. Torne, Department of Botany, S.P.C. College, Margao, Goa.

Biological control of mosquitoes using a nematode parasite—Dr J.C. Edward, Department of Biology, Allahabad Agricultural Institute, Allahabad.

Karyological studies on mosquitoes of India—Dr O.P. Sharma, Department of Zoology, Jammu University, Jammu.

Quantitation of chemical changes of chromosomes following mutagenic, etc.—Prof. A.K. Sharma, Department of Botany, Calcutta University, Calcutta.

Genetics of mental retardation—Dr P.K. Seth, Department of Anthropology, Delhi University, Delhi.

Growth of *Ephedra* tissue in culture with special reference to secondary products—Dr H.C. Arya, Department of Botany, Jodhpur University, Jodhpur.

Pollution studies of Chambal River and surroundings due to Nagda Industrial Complex—Dr P.S. Dubey, Vikram University, Ujjain.

Study of the variation of total lipid and protein in relation to weight, etc.—Dr Biswanath Mitra, Department of Zoology, Viswa-Bharati, Santiniketan (West Bengal).

Taxonomy, cytogenetics structures and physiology of venomous myriapods of India, etc.—Prof. C.M.S. Dass, Department of Zoology, University of Delhi, Delhi.

Civil Engineering Research Committee

Bearing capacity of shallow footings on medium dense to loose sands—Shri N.M. Patel, Department of Civil Engineering, Delhi College of Engineering, Delhi.

Experimental investigations on the design properties of low-, medium- and high-strength concrete using foamed slag lightweight aggregates—Dr B.S. Basavarajaiah, Department of Civil Engineering, Karnataka Regional Engineering College, Surathkal (S.K.).

Design of grouted-rock bolt system for stability of tunnel roof—Dr Bhawani Singh, Roorkee University, Roorkee.

Funicular shells for low-cost foundations—Prof. T.S. Ramanathan Iyer, Department of Civil Engineering, College of Engineering, Trivandrum.

Pharmaceuticals and Drugs Research Committee

Synthesis of potential biologically active agents—Dr R.S. Varma, Department of Chemistry, Lucknow University, Lucknow.

Synthesis and properties of benzimidazole derivatives of medicinal interest —Dr S.P. Singh, Department of Chemistry, Kurukshetra University, Kurukshetra.

Synthesis of some non-narcotic drugs (specially Pentazocine) on commercial scale by indigenous methods—Dr B.C. Joshi, Department of Chemistry, Rajasthan University, Jaipur.

Study on the immunity in ancylostomiasis—Prof. N. K. Gupta, Department of Parasitology, Panjab University, Chandigarh.

Biochemical, Biophysical, Bioengineering & Microbiology Research Committee

Synthetic and conformational studies on ampholytic polypeptides-protein models—Dr M.V.R. Rao, Department of Chemistry, University of Delhi, Delhi.

Development of artificial kidney—Dr U. R. Shettigar, Indian Institute of Technology, Madras.

Genetics of antibiotics synthesis and differentiation in *Bacillus* species—Dr (Mrs) K. Jayaraman, Department of Biological Sciences, Madurai University, Madurai.

Transformation of blue green algae —Dr M. Lakshmanan, Department of Biological Sciences, Madurai University, Madurai.

Drugs and membrane biogenesis —Dr G. Padmanaban, Department of Biochemistry, Indian Institute of Science, Bangalore.

Regulaton of involution of chicken oviduct—Dr S. Krishnamurthy, Department of Biochemistry, Indian Institute of Science, Bangalore.

Catalyst Research Committee

Liquid phase catalytic hydrogenation of glucose and fructose by transition metal complexes—Dr S. Vancheesan, Department of Chemistry, Indian Institute of Technology, Madras.

Earth Sciences Research Committee

Graphite in the Eastern Ghat rocks —Dr B. Dash, Department of Geology, Utkal University, Utkal.

Geochemical and magnetic studies of oceanic rocks—Dr K.V. Subbarao, Department of Geology, Indian Institute of Technology, Bombay.

Regional sedimentologic study of the limestone in eastern and south-eastern Rajasthan—Dr Khurshed Akhtar, Department of Geology, Zakir Husain Engineering College, Aligarh Muslim University, Aligarh.

Geochemical exploration of the Kalyadi copper belt in Karnataka—Dr Mohan Subbarao Naik, Department of Applied Geology, Indian School of Mines, Dhanbad.

Sedimentary facies pattern at the mouth of the Mahanadi River in Cuttack District—Dr Manmohan Mohanti, Department of Geology, Utkal University, Ravenshaw College, Cuttack.

Instruments Research Committee

Design and development of a particle counter (in collaboration with the Central Scientific Instruments Organisation, Chandigarh)—Dr Narendra Nath, Department of Physics, Kurukshetra University, Kurukshetra.

Design and development of digital transducers—Prof. A. K. Chaudhury, Institute of Radiophysics & Electronics, Calcutta University, Calcutta.

Development of high-performance dc servomotors—Dr V. V. Athani, Department of Electrical Engineering, Indian Institute of Technology, Bombay.

Electronics, Materials & Components Research Committee

Development of thin film microcircuits—Dr S.R. Jawalekar, Department of Electrical Engineering, Indian Institute of Technology, Bombay.

Development of microwave semiconductor devices—Prof. S. Mahapatra, Department of Electrical Engineering, Indian Institute of Technology, Bombay.

Development of silicon MOS capacitor or MOS varactor—Dr M.K. Achuthan, Department of Electrical Engineering, Indian Institute of Technology, Madras.

Physical Research Committee

Internal magnetic and electrical quadrupole fields by perturbed angular correlation studies and Mössbauer effect—Prof. H.S. Hans, Department of Physics, Panjab University, Chandigarh.

PATENTS FILED

914/Cal/75 : A new method for the production of master alloy of aluminium and magnesium, K. Venugopalan, V. Aravamuthan, Mohamed Kamaludeen & N. G. Ranganathan—CECRI, Karaikudi.

915/Cal/75 : Improvements in or relating to colouring of nickel chrome stainless steel, B. A. Shenoi, R. Subramanian & R. Venkatachalam—CECRI, Karaikudi.

916/Cal/75 : Improvements in or relating to decorative anodizing of aluminium and its alloys in alkaline electrolytes using alternating current, B.A. Shenoi, V. Balasubramanian & S. John—CECRI, Karaikudi.

917/Cal/75 : Improvements in or relating to the preparation of new dyes containing heterocyclic quinonoid systems, N. R. Ayyangar, S. R. Purao & B. D. Tilak—NCL, Poona.

1020/Cal/75 : Ultrasafe blasting circuit tester, A. J. Prakash, P. K. Dutta & S. Bagchi—CMRS, Dhanbad.

1119/Cal/75 : Improvements in or relating to an electrolytic process for the removal of iron value selectively from ilmenite/ferro-titanous ore and thereby producing beneficiated/upgraded ilmenite or synthetic rutile, S.K. Jain & P.K. Jena—RRL, Bhubaneswar.

1120/Cal/75: Improvements in or relating to development of active material for pocket type and pressed mass type nickel cadmium cells (positive active material), H.V.K. Udupa, P.V. Vasudeva Rao, R. Sabapathi, V. Chidambaram & K. Balakrishnan—CECRI, Karaikudi.

1164/Cal/75: Improvements in or relating to chromate treatment of zinc and die-cast zinc alloy, K.S. Rajagopalan, P.L. Annamalai, (Mrs) V. Subramanyan, C. Rajagopal & (Mrs) V. Ramakrishnan—CECRI, Karaikudi.

1165/Cal/75: Quick-setting resin bolt, N.M. Raju & S. Bagchi—CMRS, Dhanbad.

1166/Cal/75: Improvements in or relating to the soak cleaning of steel contaminated with oil, K.S. Rajagopalan, R. Srinivasan, C. Rajagopal, N. Krithivasan, (Miss) M.E.K. Janaki, (Miss) M. Sethukumari & P.S. Mohan—CECRI, Karaikudi.

1185/Cal/75: Improvements in or relating to a process for the catalytic conversion of water-soluble nitriles to amides, S.K. Ray, S.C. Ray, D.N. Singh & C.S.B. Nair—CFRI, Dhanbad.

1187/Cal/75: A sub-soil deformeter, S. Venkatesan—CBRI, Roorkee.

1268/Cal/75: Recoverable rope bolt, N.M. Raju, S.P. Sinha, & L.M. Prasad—CMRS, Dhanbad.

1269/Cal/75: Temper annealing and transformation annealing heat treatment of high-speed tools to improve tool life, S. Jena, A. Basu & K.B. Ghosh,—CMERI, Durgapur.

1270/Cal/75: Improvements in or relating to a process for the preparation of methyl bromide, H.M. Bhavnagary, T.S. Krishnamurthy & S.K. Majumder—CFTRI, Mysore.

Fibres and Composites : Symposium at NPL

The Department of Science and Technology is implementing a project concerned with the development of newer and conventional fibres and composites thereof. Six national institutions are participating in the project to develop the necessary technology. The UNDP is also collaborating in this project. As part of the project an international symposium is being organized by the Department of Science and Technology in collaboration with the National Physical Laboratory (NPL), New Delhi on 19 & 20 January 1976 at NPL. The symposium will consist of talks by several invited experts in this field, both from abroad and from within the country, on such topics as raw materials, product and product processing, analysis and design, testing and quality control.

The symposium thus provides a unique opportunity to bring to focus the most recent developments which have taken place in this field both in India and elsewhere. An exhibition displaying the various products developed within the country, as well as the testing procedures, will be held.

The symposium is open to scientists and technologists working in this field in various institutions in India, as well as representatives from the different industries.

Further particulars regarding the symposium may be obtained from Dr V.G. Bhide, Deputy Director, NPL, New Delhi 110012.

Symposium on Optical Techniques and Instruments

The fourth All India Symposium on Optical Techniques and Instruments Used in Scientific and Industrial Measurements will be held at the Central Scientific Instruments Organisation (CSIO), Chandigarh, from 21 to 25 January 1976 under the joint auspices of CSIO and the Optical Society of India. An exhibition of optical instruments will also be held on this occasion.

Workshop on Navigation in Oceanography

The National Institute of Oceanography (NIO), Panaji, will be organizing a workshop on Navigation in Oceanography from 14 to 17 January 1976. The workshop will review the recent advances in marine surveys and position-fixing techniques. The applicability of some of these systems to Indian offshore areas, particularly with reference to the problems of exploration and survey in the country, will be discussed.

Further details regarding the workshop can be had from the Director, National Institute of Oceanography, Dona Paula, Panaji, Goa 403111.

Pugwash Conference on Science & World Affairs

The 25th 'Pugwash' Conference on Science and World Affairs will be held in Madras from 13 to 19 January 1976. Financial assistance for holding the conference is being provided by the Jawaharlal Nehru Memorial Fund, the Department of Atomic Energy, the Indian Council of Social Science Research, the Council of Scientific & Industrial Research and the Ministry of External Affairs.

The theme of the conference is 'Development Resources and World Security'. As this is the 25th conference it affords an excellent opportunity to review the origins and evolution of the Pugwash Movement and take stock of its present position.

In the Pugwash tradition the conference will undertake most of its work in specialized working groups whose sessions will be closed to the public. However, at the end of the conference the Pugwash Continuing Committee will issue a statement covering all the major issues deliberated upon by the conference and the recommendations and proposals the Pugwash Movement makes.

The Prime Minister Shrimati Indira Gandhi will address the conference.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 15/75

Applications are invited for a post of Project Officer for the Science & Technology Centre of the Nehru Science Complex being set up at Bombay by the Council of Scientific and Industrial Research. This centre, unlike traditional science museums, will provide facilities to bring out the best of creative, innovative and scientific temper/talents in people; and to demonstrate the impact of science on society. The centre will have collections showing important landmarks in science and technology and various applications of technology with the help of specially designed animated exhibits. It will have a children's science section to create in children interest in science with the help of working and animated exhibits, specially designed for participation by children. The centre will also serve as an effective liaison between laboratory research and the prospective entrepreneurs and will portray research and development activities by visual and audiovisual means. With the help of fairs and exhibitions it will assist in the transfer of technology from research laboratories to industry. The centre will develop new concepts and designs for exhibits to be used for teaching and demonstration purposes and their prototype production. A research centre for study of history of science and technology will also be developed.

Job Requirements : The Project Officer will provide leadership in organizing and conducting research on source materials and guiding the design of exhibits. He would assist in planning the centre's buildings, and infrastructure for production of prototypes and serve as a link between the architect for the project and the construction unit. He should help the transfer of research results from laboratory to industry.

Qualifications . High academic qualifications in physical sciences or engineering with proven ability in planning and setting up industrial and technological museums and management abilities relating to the job requirements mentioned above; research abilities in design of scientific demonstration aids and on the impact of science in society.

Salary/Conditions of Service: The salary scale attached to the post is Rs 2000-125/2-2500 or Rs 1500-60-1800-100-2000 (depending upon the qualifications and experience of the selected candidate). Initial pay in the scale will be fixed according to merits. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. Completed *curriculum vitae* proforma must reach this office on or before 24 January 1976.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

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CEERI's Get-together with Industry

With a view to exploring the possibilities of setting up electronics industries in Rajasthan with special reference to the natural resources and facilities available in the state, the Central Electronics Engineering Research Institute (CEERI), Pilani, organized a get-together with industry on 'Opportunities for Electronics Industries in Rajasthan' on 26-27 September 1975. The get-together was organized in collaboration with the Department of Industries of Rajasthan, Rajasthan State Industrial and Mineral Development Corporation (RSIMDC), Small Industries Service Institute (SISI), Jaipur, Birla Institute of Technology and Science (BITS), Pilani, and Hindustan Copper Ltd, Khetri.

One hundred and two delegates, representing industry, state industrial development corporations, government departments, the National Research Development Corporation of India (NRDC), BITS and CSIR participated in the get-together.

In his welcome address, Dr Amarjit Singh, Director of CEERI, emphasized the need to take up projects which have relevance to the country's needs. Mentioning the role of scientists, industry and the policy makers of the government, Dr Amarjit Singh pointed out that there is an inherent conflict between research and industry as the industry wants stability, safety and security, whereas research leads to change. The policy makers, he pleaded, should help provide an atmosphere which would ensure the utilization of research by industry.

The get-together was divided into five technical sessions. In the first session, scientists from CEERI gave details of R & D activities, products and processes developed, services rendered to industry and CEERI's role in indigenous development of electron devices and equipment in five major areas, viz. special-purpose vacuum tubes, semiconductor devices and integrated circuits, electronic instrumentation and control systems, communication and television systems, and audio engineering and acoustics. Shri R. L. Mishra, Managing Director of RSIMDC, spoke of the initiative taken by CEERI in bridging the communication gap between a research institute and industry by making available the results achieved at the institute to the industry. He stressed that R & D institutes should have extension service for assisting the industry.

In the second session, devoted to industrial activities in Pilani, Shri Vijay Singh, Director of Industries, Jaipur, mentioned that electronics is not a energy-intensive but a labour-intensive industry and that its gestation period is much less compared to that of other industries. Taking advantage of the technical assistance rendered by CEERI and the facilities provided by RSIMDC, a number of new electronics industries could be set up in the state. He further stressed that if industries are set up now in the recession period with all the facilities and concessions available from the government, high profits could be achieved with the start of the boom period. The advantages of setting up new industries in Pilani were highlighted in a paper presented by Shri G. L. Sethi of CEERI. Shri P. K. Jain of the Department of Industries of Haryana pointed out, in his paper, the ambitious plans of the Haryana Government for setting up industries.

In the third session, at which the representatives from industry expressed some of their difficulties, Dr Amarjit Singh suggested that polytechnology clinics should be set up in Rajasthan to bridge the communication gap between technologists and users of technology and said that necessary steps were being taken in this direction. Shri C. G. Subramanian of NRDC stated that the Corporation gets know-how evaluated from agencies like CIL before it is commercially exploited and that this procedure should satisfy financial corporations which provide assistance to industry.

In the fourth session, Shri K. B. Subramanian of the Hindustan Copper Ltd, Khetri, presented a paper in which he pointed out that Khetri Complex is trying to reduce its dependence on imported know-how and to organize its import substitution drive through its own R & D and with the help of other agencies like CEERI in a manner by which technological obsolescence could be avoided.

Prof. K. V. Ramanan of BITS stated in his paper that through proper coordination it was possible to tap the spare capacity of educational institutions in terms of personnel, equipment and training facilities for giving a boost to the growth of small-scale industries in electronics in Rajasthan.

In the fifth and final session, devoted to training activities, Dr V. K. Mandke of BITS dealt with the 'practice school' programme of BITS, a salient feature of which is to help students to participate in the economic construction of the nation even during the course of education. Shri P. K. Rangole of CEERI dealt with the training activities at CEERI.

Exhibition of Building Materials and Construction Techniques Developed at CBRI

The Central Building Research Institute (CBRI), Roorkee, in collaboration with the Gujarat Engineering Research Institute, organized an exhibition-cum-lecture programme at Baroda on 23 October 1975. The programme was attended by about 200 participants.

In his inaugural address, Shri Makran Desai, Minister for Housing and Accommodation, Gujarat Government, stated that the low-cost housing project undertaken by CBRI was a successful venture in the direction of establishing the use of research findings. He emphasized the need for cooperation between the housing agencies such as the Gujarat Housing Board and Gujarat Slum Clearance Board and CBRI. Pointing out that the problem of water supply was still not attended to, Shri Desai suggested that CBRI should take up a project for developing such a design of a precast prefabricated water tower that overhead tanks could be erected without going into detailed structural designs and complicated techniques required for making an R.C.C. water tower. He assured the institute of all cooperation at the government level in overcoming any hurdles in the implementation of the research results.

The Director of CBRI, Prof. Dinesh Mohan, assured the Minister that the institute was prepared to take up any specific problem pertaining to the Gujarat region and to extend cooperation to all construction agencies. He dealt with in brief the activities of the institute in general and the problems of the Gujarat region in particular. He called for improvement in the quality of bricks in the larger interest of economy. In this connection he referred to mechanical methods of manufacturing better-quality bricks from inferior soils and use of under-reamed pile foundation in black cotton soil areas.

Lectures on recent developments in building materials, construction techniques with special reference to their application in Gujarat, and use of pozzolana for building construction were delivered. A meeting was also arranged between the Director and the representatives of major organizations of Gujarat who discussed their problems and offered to take up experimental construction works.

CBRI Takes up Experimental-cum-Demonstration Project for GHB

An experimental-cum-demonstration project on the construction of houses in Amraiwadi, Ahmedabad, for the economically weaker section of society was taken up by the Central Building Research Institute (CBRI), Roorkee. The work was entrusted to CBRI by the Gujarat Housing Board (GHB).

The houses were planned as single-storeyed structures providing minimum basic requirements of a habitual house. The concept of single-storey house was necessary to provide for the expansion of the house on the first floor, which might be desirable with the rise in income levels of the habitant; the dwellings could be extended vertically. In addition to the construction of 216 houses, a block of six shops and a primary school were also completed by the institute under this project by adopting the following techniques : rationalized planning for use of maximum space (based on architecture and physical planning research studies), rationalization of foundation design, staggering walling system to use brick masonry to its maximum efficiency, magnesium oxychloride door/window frames, precast lintels/chajjas, precast cellular unit roofing system with precast prestressed joists, local wood for door/window shutters, and frameless door in water closet. The CBRI techniques effected an overall saving of 21% as against conventional construction being done by GHB. The overall cost of construction was about Rs 192/m².

Conference Briefs

Dr B. C Raychaudhuri, Head of the Heat Transfer & Applied Science Division, Central Mechanical Engineering Research Institute (CMERI), Durgapur, represented India at the fourteenth International Congress of Refrigeration held at Moscow from 20 to 30 September 1975. The congress was held under the auspices of the International Institute of Refrigeration (IIR), Paris. India is represented by CSIR as a member of IIR, and a National Committee of IIR (NCIIR) has been constituted by CSIR. Dr Raychaudhuri is the official Indian delegate to the executive committee of IIR and convenor of NCIIR with its secretariat located at CMERI.

The plenary sessions of the congress dealt with : refrigeration and foodstuffs, reliability with refrigerating systems, refrigeration in medicines, and role of cryogenics in the solution of world energy problems. Dr Raychaudhuri presented four Indian papers at the congress, including one from CMERI. The CMERI paper was entitled 'Prediction of thermal properties with phase changes during freezing or thawing of food slabs'.

During his stay at Moscow, Dr Raychaudhuri participated in the meeting of several IIR committees. Dr Raychaudhuri has been elected one of the Vice Presidents of the Executive Committee of IIR for a four-year period (1975-79). He is the first Indian to be elected to this office.

The need for constituting NCIIR by every member country was emphasized at the General Conference. Dr Raychaudhuri requested IIR to provide more support to the activities of the Indian National Committee by deputing experts to the annual symposium on refrigeration sponsored by NCIIR. The view was well received and it was agreed to take up the matter in a future meeting.

In the meeting of the Scientific Council, Dr Raychaudhuri submitted a proposal for the formation of a permanent standing working group for developing countries and to include several members in the group from developing countries as well. This was also well received and the matter would be taken up in a future meeting.

Dr Raychaudhuri also visited some of the refrigeration institutes and organizations in USSR.

Bibliography on Wind Power and Windmills

Brought out by the National Aeronautical Laboratory (NAL), Bangalore, this bibliography contains 583 references to literature (papers, conference proceedings, translations, theses, patents, etc.) published during 1960-74, and covers: development of windmills, design, operation, performance, wind behaviour, velocity measurement, wind data, economics of utilization, site selection and installation, uses of wind machine—lift and irrigation, electric power generation and supply, types of windmills, etc. Institutional sources of information for construction plans of windmills, windmill manufacturers and distributors are also given.

Further enquiries relating to the bibliography may be directed to: The Director, National Aeronautical Laboratory, Post Bag 1779, Bangalore 560017.

Cement Standards of the World

The fourth edition of 'Cement Standards of the World' (SP-1-1975) has been brought out by the Cement Research Institute of India (CRI), New Delhi. The first edition was published by CRI in 1969. The new edition, covering 76 countries as against 44 in the previous edition, has been updated by incorporating many amendments/revisions. International standards covering specifications, quality requirements and acceptance criteria are recorded in respect of Portland cement, Portland blast furnace slag cement, Portland pozzolana cement, and Special cements.

Further details regarding the publication can be had from : The Director, Cement Research Institute of India, M 10, NDSE Part II, New Delhi 110049.

Cement-grade Limestone Deposits : CRI's Guide Norms for Prospecting

Proper prospecting, exploration and reserve estimation of limestone deposits are essential prerequisites for making decisions for setting up cement plants. Keeping this in view, several panel meetings, including a seminar, were held under the joint auspices of the Cement Research Institute of India (CRI), New Delhi, and the Geological Society of India. The 'Guide Norms for Prospecting, Exploration, Reserve Estimation, and Technological Assessment of Cement-grade Limestone' (SP-9-1975) published by CRI is the outcome of such meetings and seminar. The 110-page publication contains chapters on Classification of limestone deposits, Categorization of reserves, Phasing of prospecting and exploration, Exploration programme for different types of limestone deposits and different categories of reserves, Sampling, Technological assessment, Reserve estimation, and Recording and reporting of data.

Further details regarding the publication can be had from : The Director, Cement Research Institute of India, M 10, NDSE Part II, New Delhi 110049.

Progress Reports

CBRI Annual Report : 1974

The annual report of the Central Building Research Institute (CBRI), Roorkee, for the year 1974 has been published recently. According to the report the institute was engaged mainly in developing techniques for low-cost housing and utilization of wastes in making building materials. A comprehensive housing scheme incorporating CBRI techniques leading to 23% economies was worked out for the Gujarat Housing Board. Several CBRI techniques have been used in the construction of the Life Insurance Corporation of India quarters (320 four-storeyed) at Shahadra (Delhi) and about 1000 dwelling units in Delhi by the Delhi Development Authority. About 50 lakh improved quality bricks from black cotton soils were produced by the Public Works Department and the Housing Board of Madhya Pradesh. A few of the important research activities of the institute are mentioned below.

A field trial for manufacturing clay-fly ash bricks was successfully carried out at a kiln near Delhi, resulting in an economy of about 27% in coal consumption. Work carried out on the production of stabilized bricks from lateritic soils showed promising results. Masonry cement was produced by intergrinding cement, slag and fly ash in suitable proportions. Studies carried out on corrosion of steel reinforcement in pozzolana concrete revealed no appreciable difference in the protective behaviour of fly ash cement concrete and cement concrete without fly ash. A high-quality pozzolanic material was developed from rice husk.

The process of constructing bored compaction piles was improved and made speedier by replacing the outside reinforcement cage with precast RCC piles having projections around them. Successful full-scale field trials were carried out in constructing diaphragm wall at three sites of Sarda Sahayak Pariyojana of U. P. Irrigation Department. The process has been further improved and it is now possible to construct 40 cm thick wall. A pilot field trial of ground strengthening by rope drains was also successfully completed in the Salt Lake area at Calcutta. Designs and technical assistance for using under-reamed or bored compaction piles for foundations were provided to various projects like microwave antenna tower, transmission line tower, chimneys and multistorey building.

A goniophotometric set-up was perfected at the institute for testing the suitability of glazing materials for roof lighting and side lighting. For measuring thermal conductivity of building and insulating materials, a standard guarded hot plate apparatus was fabricated and tested. Studies on the cooling of buildings by roof surface evaporation indicated an efficient and economical method of controlling the indoor thermal conditions. The acoustical study conducted to establish the relationship between height and type of ceilings in different school buildings has indicated that the ceiling of normal-sized class-room (7 m × 5 m) should be at least 3·4 m. The height could be reduced to 3 m in absorptive type false ceilings or corrugated type ceilings.

Stone masonry blocks developed by the institute were used by the Delhi Development Authority, U. P. Housing Board and A. P. Police Housing Corporation for constructing cheaper houses. Prefabricated brick panel system and brick skeleton system of construction for building houses in rural areas were adopted by the Rural Engineering Department of U. P.; 42 houses were constructed in three districts.

Under the U. P. School Building Project, construction of 2200 primary school buildings was completed. A study conducted on the planning of industrial townships resulted in several useful recommendations which were accepted by the Bureau of Public Enterprises. As a case study, layout plan was developed for future development of Khetri township.

Field trials were successfully carried out with a heat-sensitive fire detector developed at the institute.

RRL, Jorhat, Annual Report : 1973

The annual report of the Regional Research Laboratory (RRL), Jorhat, for the year 1973 records projectwise the progress of R & D work of the laboratory under 14 major disciplines. To facilitate R & D and extension work, the laboratory established three sub-stations in the states of Nagaland, Manipur and Meghalaya. Negotiations were under way to set up two more sub-stations in Arunachal Pradesh and Tripura.

During the year under report 20 processes were released for commercial utilization and 19 processes were completed and referred to the National Research Development Corporation of India for commercial exploitation.

In the area of paper, cellulose and boards, the processes developed during the year relate to the production of matrix board for rubber stereo, paper slate, direct copy paper, particle board, moulding powder and paper boards. A modified polyvinyl alcohol binder system was developed; it could be used for the production of various types of non-woven products.

Potassium silicate solution prepared at RRL was evaluated by the Bharat Electronics Ltd, Bangalore, and found to be suitable for coating TV tubes. A new technique was developed to stabilize the silica sol prepared by ion-exchange technique. The percentage of silica in the sol could be raised to nearly 30% by concentrating the diluted silica sol after stabilization without gel formation. A process for manufacturing refractory insulating bricks from rice husk was developed.

At the instance of the Hindustan Steel Ltd, work on the pelletization of iron ore fines from Rajra mines was taken up. About 1·5 tonnes of pellets were prepared by the process developed in the laboratory and sent to the National Metallurgical Laboratory, Jamshedpur, for evaluation.

A significant achievement was made in the preparation of high-purity iron oxide for ferrite industry. High-purity alumina (99·9%) from scrap aluminium was produced on a laboratory scale (295 g per batch). High-purity alumina is specially used in electronics industry.

The processes for the manufacture of carbon black from coal and furfural from agro-industrial waste were completed. The preparation of feasibility reports for the above processes was assigned to Engineers India Ltd and R. L. Dalal & Co. respectively. A channel black product from natural gas with properties similar to those of paint-grade channel black was developed.

In the area of petroleum and petrochemicals, the laboratory continued work on process know-how for caprolactam, terephthalic acid, thymol, biphenyl, askerols, and speciality products like speciality grease and white oil. A process was developed for the preparation of dibenzyl sulphide, used as a rubber antioxidant and as antifreeze and anticorrosive additive in fuels and lubricating oils. A process was also developed for the deodorization of heavy kerosene.

Pharmaceuticals and fine chemicals for which processes were developed include : (i) 8-hydroxyquinoline, an intermediate for the manufacture of iodochlorohydroxyquinoline and other halogenated derivatives which are extensively used as antidysentery drugs; (ii) phenobarbitone, used as hypnotic and sedative; (iii) 2,4-dinitrochlorobenzene; (iv) tolbutamide, used for oral treatment of diabetes mellitus; (v) diethylaminoethanol; (vi) triphenyl phosphate, a plasticizer used in photo-film industries; (vii) furfuryl alcohol from furfural; and (viii) phenylbutazone, an antiarthritic and antinflammatory drug.

Investigations on the production of single cell protein from petroleum hydrocarbons were continued and an improved method of processing the yeast biomass was developed. The product obtained by this process was found to be nutritionally satisfactory for rats.

Studies on the production of bromelain, a proteolytic enzyme, from pineapple waste were completed. It was found possible to obtain a yield of 0·2% of bromelain. The work on bacterial protease was continued and optimum conditions for its production were worked out.

Considerable progress was made in the propagation of citronella and other medicinal and aromatic plants. Planting material of Java Citronella was supplied to 210 parties. The area under citronella cultivation was 4075 acres and the total production of citronella oil during the year was about 55·90 tonnes.

Other important projects under investigation at the laboratory relate to: saccharification of cellulose, utilization of used Nichrome wire, light-weight aggregates, and bricks from paddy husk and paddy husk ash.

Nineteen papers were published, 8 patents were sealed, and 21 patents were filed during the year.

The financial inputs for 1973-74 amounted to about Rs 3·98 million.

CSIR Support To Research

New Schemes

Statical and Dynamic Behaviour of Cable-stayed Bridges

The cable-stayed bridge is a recently developed structural system for bridging the spans in the approximate span range of 150 to 500 m. These structures are aesthetically better than ordinary bridges and economical in the above span range. They are stiffer than suspension bridges as far as aerodynamic instability is concerned. Only a limited amount of work has so far been done on structural analysis and behaviour of such bridges. Recent developments in cable-stayed bridges have taken place mainly in Germany, and its lead has been followed by other European countries.

Under a new CSIR scheme sanctioned to them, Dr A. S. Arya (principal investigator) and Dr Prem Krishna (co-principal investigator) of the University of Roorkee propose to analyze cable-stayed girder bridges and to study their behaviour under static and dynamic loading. Nonlinear analysis to account for the large deflections of the towers and girders will also be made.

Development of an approximate method for analysis of cable-stayed girder bridges will be attempted. For this purpose the analysis of these bridges will be carried out assuming the girders as beams on elastic foundation, the elastic support to the girder being provided by the cable. This method of analysis of cable-stayed girder bridges may be suitable for the design offices for making preliminary design estimates.

It is also proposed to prepare a set of design curves suitable for design office use, showing the effect of variation of different design parameters of the bridge. This will involve the analysis of cable-stayed bridges by stiffness matrix method, treating the bridge as a plane frame. In order to justify the validity of the assumptions made in the theoretical analysis, the results obtained theoretically will be compared with those obtained experimentally. For this purpose experiments will be carried out on the model of the proposed Hooghly Bridge.

Hovercraft : A Feasibility Study

Hovercraft are used in the West and USSR for transport and geological explorations in difficult terrains. In India, a long coastline, stretches of marshy land, desert tracks in border areas and rivers which inundate low-lying areas during monsoon offer an enormous scope for the use of such vehicles. Under a new CSIR scheme granted to them, Prof. M. M. Sivaramakrishnan (principal investigator) and Prof. K. Rajaiah (co-principal investigator) of the Aeronautical Engineering Department, Indian Institute of Technology, Bombay, propose to carry out a feasibility study on these vehicles. The study will be aimed at providing the basis for end-design, fabrication and development of a prototype of hovercraft.

Syntheses of High Temperature Organo-Silicon Elastomers

The growing demands for high-performance materials in industrial and aerospace research underline the need to develop polymers having high strength, low density, high thermal stability and resistance to chemicals and oxidation. With this objective research has been geared to modifying industrial organic polymers through incorporation of silicon moiety. For instance, elastomeric siloxane-styrene block copolymers with good weathering and electrical properties have been developed and patented by Dow Corning. Butadiene vinyltriorganosilane block copolymers having T_g of 50-180° have also been reported.

In a new CSIR research scheme granted to her, Dr (Miss) P. Bajaj of the Textile Technology Department, Indian Institute of Technology, Delhi, proposes to synthesize a number of new organo-silicon elastomers by copolymerizing butadiene, styrene, vinyl chloride, etc. with various vinyl silicon monomers through free-radical and anionic polymerization methods. Physico-mechanical properties and thermal and dielectric behaviour of these elastomers will also be studied. These investigations are likely to yield a useful correlation between the nature and position of organo-silicon moiety and the properties of the polymers.

Total Synthesis of Prostaglandins and their Analogues

Prostaglandins are a group of naturally occurring hydroxycyclopentane acids, derived from fatty acids isolated from mammalian tissues, and are believed to be regulators of various body functions such as muscle relaxation, lipid metabolism, and central nervous system, cardiovascular and reproductive physiology. They have been used to regulate menstruation and fertility, prevent conception, induce child birth, lower blood pressure, prevent blood clots, treat asthamatics and act as long-lasting nasal decongestants. Because of the importance of these compounds, which occur in minute quantities (the richest source appears to be human seminal plasma which contains prostaglandins of up to 300μg per ml level), several groups of workers have successfully carried out the total synthesis of these compounds and their analogues, and large-scale preparations are now being processed. With the recent discovery of the presence of prostaglandins in gorgonians (e.g. *Pleuxeria homomilla*) it is now possible to study their chemistry and biology and to evaluate them more thoroughly for clinical use. In a new CSIR research scheme granted to Dr G. S. R. Subba Rao of the Department of Organic Chemistry, Indian Institute of Science, Bangalore, it is proposed to develop a new stereoselective route for the synthesis of prostaglandins and their 15-methyl- and 16, 16-dimethyl derivatives. In addition, the corals of the Laccadive Islands will be investigated for the presence of prostaglandins.

Heavy Ion Source for Ion Implantation

Introduction of foreign atoms into a solid substrate by accelerating their kinetic energies is termed as ion implantation. It is interesting to study the solid state properties of a substrate with foreign atoms as a number of physical properties, viz. electrical, optical, magnetic and superconducting, are affected by implantation. Under a new CSIR research scheme granted to him, Dr I. M. Govil of the Physics Department, Panjab University, Chandigarh, proposes to construct a heavy ion source capable of giving analyzed beams of heavy ions (As, B, Li, etc.) with the energy range of 30-100 keV. These ions will be implanted in various semiconductor substrates to study the effects on their electrical and magnetic properties.

Control of Mosquitoes using Nematode Parasite

With the increasing realization of the harmful effects of DDT and other persistent insecticides to man and his environment, much interest is being evinced in the utilization of nematodes for reducing the populations of selected insects. Mermithidae is a family of nematodes parasitic on many kinds of insects, and parasitism by a mermithid is usually fatal to its host.

In a new CSIR scheme entitled 'Biological control of mosquitoes using a nematode parasite' sanctioned to him, Dr J. C. Edward (principal investigator) of the Biology Department, Allahabad Agricultural Institute, Allahabad, proposes to (i) survey the different mosquito breeding sites to obtain the most effective parasitic native strain of a mermithid nematode; (ii) study the optimum temperature and other requirements for rearing the parasite; and (iii) screen the different mosquito species for susceptibility to the parasite both in the laboratory and in small-scale field experiments.

Recovery of Copper from Mill Tailings of Indian Copper Plants

Under a new CSIR scheme granted to him, Dr K. A. Natarajan, Department of Metallurgy, Karnataka Regional Engineering College, Surathkal, Srinivasnagar, proposes to develop a method for recovering copper from the tailings of concentrator plants. Mill tailings of Indian copper plants contain about 0·1% copper, which is considered as a lost value. The project envisages the recovery of copper from mill tailings of Indian copper plants, viz. the Hindustan Copper Ltd, Khetri (Rajasthan) and the Chitradurga Copper Company Ltd, Chitradurga (Karnataka). The nature and extent of distribution of the copper mineral (mainly chalcopyrite) in the tailings of the above plants will be determined and processes will be developed for concentrating the copper trapped in these tailings by considering the degree of interlocking between the copper mineral and other mineral and gangue constituents. Preliminary laboratory tests will be undertaken to separate the copper from the tailings and subsequently extract it preferentially. It is intended to develop a hydro-metallurgical technique to recover the copper values from the tailings at room temperature.

Secondary Recovery of Oil by Polymer Flooding

Polymers play an important role in the recovery of crude from reservoirs. Substantial amounts of crude can be recovered by replacing it with water-containing stable polymers. The mobility of dilute solutions of polymers has been explained in terms of visco-elastic parameters, but the effects of molecular parameters have not been fully investigated so far. Under a new CSIR scheme granted to him, Dr S. K. Baijal, Assistant Professor, Department of Petroleum Technology, Indian School of Mines, Dhanbad, proposes to examine the utility of the various water-soluble polymers, viz. polyacrylamide, polyacrylic acid, and some water-insoluble linear polymers in displacing crudes of various viscosities from unconsolidated sands. An attempt will be made to correlate the efficiency of these polymers with their molecular parameters. The probability of interaction with solid phase will also be evaluated.

Venomous Myriapoda of India

In a new CSIR scheme on 'Venomous Myriapoda of India', which is to be carried out in the Cell Biology Laboratory of the Advanced Research Centre at the Department of Zoology, University of Delhi, Prof. C. M. S. Dass (principal investigator) and Dr B. S. Jangi (Publications & Information Directorate; co-investigator) propose to study the taxonomy, cytogenetics, bionomics, structure and physiology of centipedes. To supplement the traditional approach to taxonomy, which is based [illegible]ely on external morphology, it is proposed to explore the possibility of recruiting other parameters like chromosome number and morphology, biotic, behavioural, anatomical and biochemical peculiarities with a view to evolving ultimately a more natural and reliable classification of these important animals. Aside from this, electron microscopic studies on various developing systems and gregarine parasites are postulated; and in a study of comparative venomology, the venom of different centipede species will be analyzed and the species-specific toxicity determined physiologically. Immunological studies leading to production of serum against the centipede bite will also be made.

Completed Schemes

Histology and Histochemistry of Ovaries of Red Cotton Bug

Histology and histochemistry of ovaries of red cotton bug (*Dysdercus cingulatus*) during the first gonotrophic cycle have been studied by Shri M. Jalaja (a CSIR research fellow) under the guidance of Dr V. K. K. Prabhu at the Department of Zoology, University of Kerala, Trivandrum. Changes in the neuroendocrine system during the first gonotrophic cycle have also been studied and correlated with vitellogenesis. Extirpation of median neurosecretory cells was found to result in complete arrest of yolk deposition. Extirpation followed by transplantation of median neurosecretory cells or corpus allatum from another insect restored egg maturation. Allatectomy inhibited vitellogenesis when performed in newly moulted females. Transplantation of active corpus allatum into allatectomized insects restored egg maturation, but transplantation of median neurosecretory cells from another insect into allatectomized insects could not restore egg maturation. These studies reveal that though both the corpus allatum and median neurosecretory cells are necessary for vitellogenesis, only the hormone from corpus allatum is directly involved in it. Median neurosecretory cells are involved only indirectly, i.e. by way of stimulating the corpus allatum.

Studies of the ovaries after treatment with two chemosterilants, apholate and metepa, were carried out. The ovaries were drastically affected by the treatment. Disintegration of trophocytes in the germarium forming clumps of RNA and DNA occurred as a result of the treatment. Drastic reduction of follicular epithelium and multiple oocytes in a single follicle resulted after apholate treatment. Changes in the neuroendocrine system were also observed after chemosterilization. The corpus allatum in treated insect was found to be small in size. The neurosecretory cells were also affected.

PATENTS FILED

1271/Cal/75: An electrochemical process for the production of 2-hydroxy *p*-aminobenzoic acid from *o*-toluidine sulphate, H.V.K. Udupa, M.S. Venkatachalapathy, S. Chidambaram, R.K. Srinivasan & K.S.S. Lalitha—CECRI, Karaikudi.

1381/Cal/75: A process for the production of sponge iron, D.N. Dey, A.K. Tripathy, A.K. Jouhari & P.K. Jena—RRL, Bhubaneswar.

1382/Cal/75: Thermistor velometer, K.M. Kaiser, B.C. Bhowmick, P.K. Mittra & S. Bagchi—CMRS, Dhanbad.

1383/Cal/75: Continuous drive friction welding machine (production type), S.P. Dasgupta, D. Kumar Biswas, Md. Shamsuzzoha, A.K. Banerjee, S.C. Bose, P.C. Saha & J.C. Chakraborty—CMERI, Durgapur.

1384/Cal/75 : A hand-winding machine for winding coils on multiple legs of the former, J. Singh & F. Singh—CEERI, Pilani.

1417/Cal/75 : Improvements in or relating to the production of composite nickel powder for sintered matrices used in alkaline batteries, H. V. K. Udupa, P. V. Vasudeva Rao & P. Rangorath—CECRI, Karaikudi.

1425/Cal/75 : A process for the synthesis of 2-alkyl-6-ethyl-3-(*p*-substituted phenyl)-*trans*-bicyclo (4,3,0)-nonan-7β-ols and derivatives as antifertility agents, R. C. Gupta, N. Anand & V. P. Kamboj—CDRI, Lucknow.

1434/Cal/75 : Hand-held cooking gas content indicator, T. S. Chennabasavan—MERADO, Poona.

1480/Cal/75 : Improvements in or relating to a process for the extraction of nickel and cobalt from lateritic nickel ores by reduction roasting using solid reductants like coal, coke, charcoal, followed by ammoniacal ammonium carbonate leaching, P. K. Rao, S. C. Panda & P. K. Jena—RRL, Bhubaneswar.

1481/Cal/75 : A process for the production of spermicidal saponins from plants, H. B. Garg, B. G. Setty, V. P. Kamboj & N. M. Khanna—CDRI, Lucknow.

1482/Cal/75 : Improvements in or relating to the electrolytic reduction of *o*-nitrophenol to *o*-aminophenol, H. V. K. Udupa & P. N. Anantharaman—CECRI, Karaikudi.

1483/Cal/75 : Improvements in or relating to the electrochemical preparation of *o*-toluidine sulphate from *o*-nitrotoluene, H. V. K. Udupa, M. S. Venkatachalapathy, S. Chidambaram & K. S. S. Lalitha—CECRI, Karaikudi.

1484/Cal/75 : Improvements in or relating to recovery of tellurium from copper refinery slimes, N. Singh & S. B. Mathur—NML, Jamshedpur.

1485/Cal/75 : A process for making siliconated sulphited fish oil fatliquors for leathers, K. J. Kedlaya, (Mrs) K. I. Vijayalakshmi & V. V. M. Rao—CLRI, Madras.

1486/Cal/75 : Improvements in or relating to recovery of copper from industrial byproduct copper compounds such as copper oxide waste from copper rolling mills as well as byproduct copper compounds obtained from the chemical industry, H. V. K. Udupa, P. V. Vasudeva Rao, R. Vijayavalli & K. V. Venkateswaran—CECRI, Karaikudi.

1549/Cal/75 : A process for the preparation of pharmaceutical grade polyose from *Tamarindus indica* seeds, R. C. Nandi, J. P. S. Sarin & N. M. Khanna—CDRI, Lucknow.

1552/Cal/75 : Improvements in or relating to luminescent transfer paper, C. V. Suryanarayana, M. I. A. Siddiqi, N. Rajaram, K. K. Gopinathan, R. Lakshminarayanan & (Miss) A. Kurian —CECRI, Karaikudi.

1573/Cal/75 : Improvements in or relating to a process for the production of kerosene and diesel oil from heavy stocks of petroleum such as vacuum distillates or residues, employing a specially prepared alumina base catalyst, B. B. Brahmachari, M. R. Saha, A. Bose, S. B. Basu, B. Chatterjee, A. Ganguly & V. A. K. Murthy—CFRI, Dhanbad.

1574/Cal/75 : Simple and economic process for production of smokeless, water-resistant and hard agglomerated domestic fuel from non-caking coals and their slacks, A. K. Chakravarti, A. K. Sengupta, S. K. Ghosh, P. K. Majumder & S. K. Basu—CFRI, Dhanbad.

1575/Cal/75 : An easy process for economic production of smokeless, hard and water-resistant domestic fuel from coke and char fines using non-bituminous binder, A. K. Chakravarti, A. K. Sengupta, S. Gupta & A. K. Sharma—CFRI, Dhanbad.

1576/Cal/75 : An electrochemical process for the production of *p*-toluidine from *p*-nitrotoluene, H. V. K. Udupa, M. S. Venkatachalapathy & S. Chidambaram—CECRI, Karaikudi.

1586/Cal/75 : Improvements in hydrostatic extrusion process, A. K. Agarwal—NPL, New Delhi.

1610/Cal/75 : Development of a special, shaped brick for economic fencing, B. C. Mohanty & B. C. Swain—RRL, Bhubaneswar.

1611/Cal/75 : An improved evaporation source for aluminium deposition, A. Singh & Y. K. Jain—CEERI, Pilani.

Obituary

Dr J. C. Ray

We record with deep regret the passing away of Dr Jyotish Chandra Ray, former Director of the Indian Institute of Experimental Medicine (IIEM), Calcutta. Dr Ray died on 23 November 1975 in Calcutta.

Dr Ray founded the Indian Institute for Medical Research (in 1935), which was taken over later by CSIR and renamed as Indian Institute of Experimental Medicine.

Dr Ray's work during the years before the institute came under CSIR related principally to problems of protozoal immunity, a practically unexplored area of study at that time. The work done by Dr Ray and his group demonstrated the importance and practical possibilities of protective immunitiy in malaria. In leishmaniasis, his successful cultivation of leishmania parasites on solid media was followed by studies on the serology and antigenic structure of different leishmania parasites, and the application of leishmania vaccine to the treatment of oriental sore and post-kala-azar dermal leishmaniasis. These constituted the first successful application of protozoal vaccines to therapy. His researches on amoebiasis led to the development of a complement fixation test for the diagnosis of amoebiasis. He also developed a complement fixation test for tuberculosis, using urinary proteose from known tubercular patients as antigen.

After the institute came under CSIR, Dr Ray extended his researches to a comprehensive biochemical study of leishmanial metabolism and the mode of action of antifungal antibiotics on *Leishmania donovani*.

Dr Ray started the publication of 'Annals of Biochemistry and Experimental Medicine', which is currently being published by CSIR (PID) under the title Indian Journal of Biochemistry and Biophysics.

Dr Ray was a Fellow of the Indian National Science Academy and recipient of 'Padma Bhushan'. A founder-member of the Association of Microbiologists of India, Dr Ray was President of the Association for several years.

(to)

PERSONNEL NEWS

Appointments/Promotions

Dr S. M. Abhyankar

Dr S. M. Abhyankar has been appointed on promotion Scientist E at the National Chemical Laboratory (NCL), Poona, with effect from 28 October 1975.

Born on 2 December 1927, Dr Abhyankar obtained his B.Sc. and B.Sc. (Tech.) degrees from the Nagpur University. After a brief training in various industries he joined NCL where in the course of his work he took his Ph.D. degree in chemical engineering under the guidance of Dr L. K. Doraiswamy. His major areas of interest are catalysis and reaction kinetics.

Dr Abhyankar has been actively associated with the process development programmes of NCL. With his associates he had developed processes of considerable industrial significance and these have been commissioned successfully by industrial undertakings.

Dr Abhyankar is also a member of the board of studies of the University of Nagpur.

* * *

The following have been appointed Scientist 'C' in the National Chemical Laboratory (NCL), Poona : Dr S. P. Rao (11 July 1975); Dr N. C. Karanth (20 August 1975); and Dr Ajit Sadana (22 September 1975).

* * *

The following have been promoted in NCL, Poona : Dr A. R. Mehendale (from Senior Scientific Assistant to Scientist 'B'; 23 September 1975); and Shri C. U. Saraf (from Scientist 'A' to Scientist 'B'; 25 September 1975).

Retirements

Sarvashri N. K. Buzruk, Scientist 'B', and N. M. Joshi, Scientist 'A', NCL, Poona, retired with effect from 31 October 1975.

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